User Manual

WI-I/O-EX Serial I/O Module

Weidmuller Inc., 821 Southlake Blvd., Richmond, VA 23236
Tel: (800) 849-9343 Fax: (804) 897-4136 Email: support@weidmuller.com
Web: www.weidmuller.com

Thank you for your selection of the WI-I/O-EX Serial I/O Module. We trust it will give you many years of valuable service.

ATTENTION!

Incorrect termination of supply wires may cause internal damage and will void warranty.
To ensure your WI-I/O-EX product enjoys a long life,

double check ALL your connections with the User Manual

before turning the power on.

All equipment must be **properly grounded** for safe operation.

All equipment should be serviced only by a **qualified technician**.

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- abuse, misuse, neglect or damage by external causes, or
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1 Overview

The WI-I/O-EX modules are designed to provide I/O expansion for other products like WI-I/O 9, WI-MOD-9-E and WI-MOD-E modules. The WI-I/O-EX modules support the WI Series protocol, and communicate serially via RS232 or RS485. Configuration is done via the WI Series configuration utility.

The WI-I/O-EX modules also support ModBus protocol. They may be used as a ModBus slave with any 3rd-party ModBus device, or with the WI-GTWY modules using ModBus. They support both ModBus ASCII protocol, and serial un-signed ModBus RTU, also known as "ModBus binary". The ModBus slave address of the WI-I/O-EX is selected via two rotary switches on the bottom panel of the case.

All WI-I/O-EX models provide digital inputs and outputs. Specific models provide analog inputs or analog outputs. Pulsed inputs and pulsed outputs are also available. Several modules may be connected to one master, allowing any combination of I/O types.

Figure 1-1 shows a diagram of a WI-I/O-EX module with parts labelled.

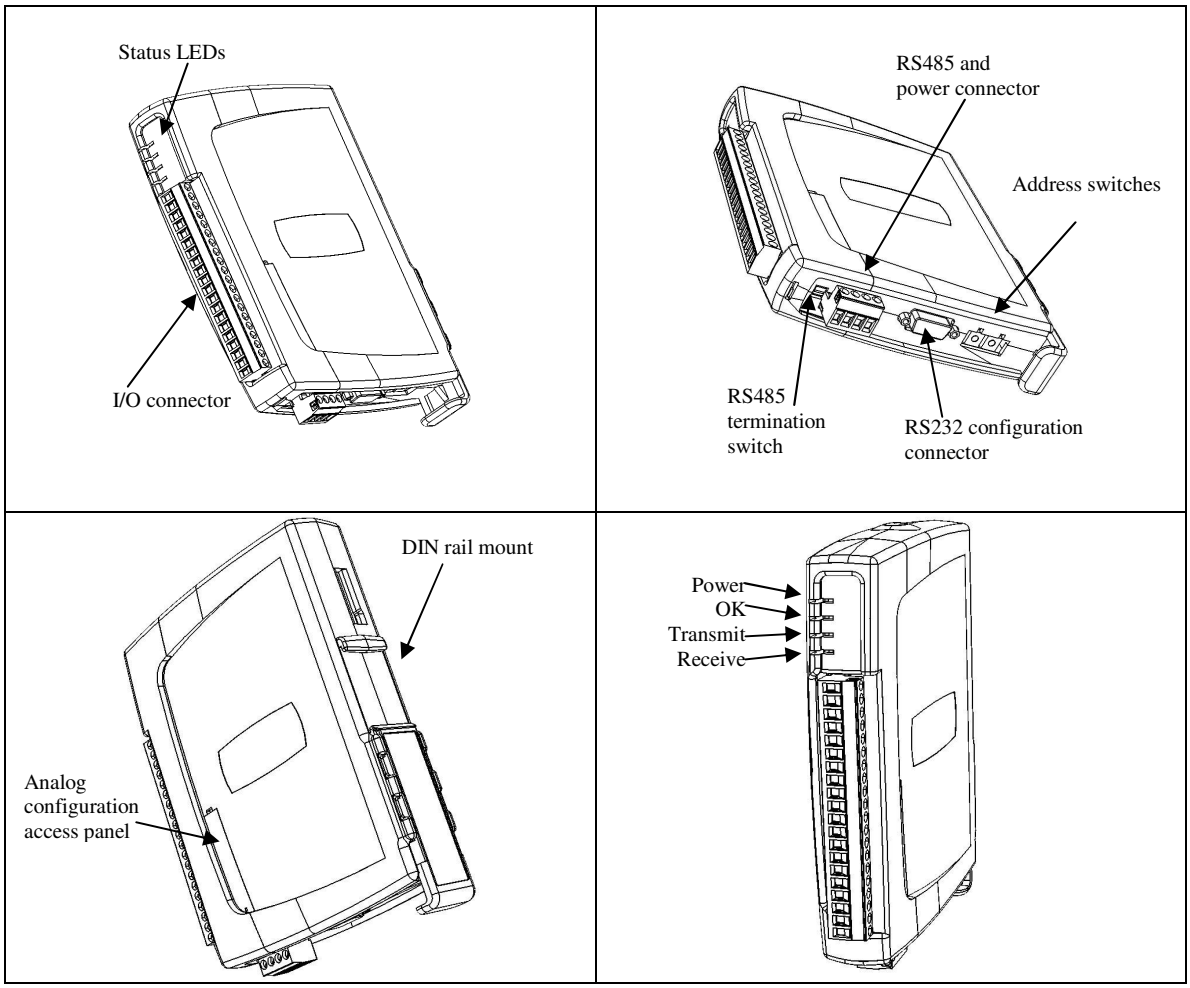


Figure 1-1: WI-I/O-EX unit with significant parts labeled.

Two ports allow configuration and communications on the WI-I/O-EX. The RS232 port is intended for configuration. The RS485 port allows the unit to be in a multi-drop configuration.

Overvoltage protection and supply monitoring is provided to minimize the risk of failure due to faulty connections or supply surges.

1.1 Module types and features

The module types and I/O are summarized in Table 1-1.

WI-I/O-EX	-11	-12	-13
Digital inputs/outputs	Up to 16	Up to 8	Up to 8
Pulse outputs	8	8	8
Pulse inputs	4	-	-
Analog inputs	-	4 floating or 8 commoned	-
Analog outputs	-	-	8

Table 1-1: Summary of WI-I/O-EX module types and I/O.

1.1.1 Digital inputs / outputs

Each digital I/O channel on the WI-I/O-EX modules can act as either an input or an output. The input/output direction does not need to be user configured.

Digital inputs are suitable for voltage-free contacts, or NPN-transistor switch devices.

Digital outputs are open-collector transistor outputs, able to switch loads up to 30VDC, 200mA.

If you have wired an input/output channel as an input, it is recommended that you do not write values to it as an output. No electrical damage will occur if you attempt to use a channel wired as an input as an output, or vice-versa, however the I/O system will not operate correctly.

We recommend that the required digital inputs be assigned consecutively from channel 1. Then use the remaining channels as digital outputs.

1.1.2 Pulsed outputs

The first eight digital channels on each WI-I/O-EX module can be used as pulse outputs. The maximum output frequency is 100Hz.

A pulse output on the WI-I/O-EX will output the number of pulses equal to the register value sent by the master. When the master sends a new register value, the WI-I/O-EX will output additional pulses until the output count is the same as the new value.

Three register values are associated with creating each pulsed output:

- The *Count* keeps a tally of how many pulses have been output - this is a 16-bit register and overflows to 0.
- The *Target* is set by the master, and is the trigger for pulses to be created. The digital channel outputs pulses until the *Count* value reaches the *Target* value. If the *Target* register is set to 0, the pulses stop and the *Count* register is cleared.
- The *Update Time* is the interval in which the WI-I/O-EX expects to receive updates to the *Target* value. The module will output enough pulses for the *Count*

to reach the *Target* within the update time. The output pulse rate is determined by the update time, and the difference between the count and the target.

If the calculated pulse rate is more than the maximum rate (100Hz), the WI-I/O-EX will output pulses at the maximum rate. At the end of the update time, the count value will be less than the target. The WI-I/O-EX will then calculate the new required pulse rate for the next update period, based on the difference between Count and Target values.

If the calculated pulse rate is greater than around three times the maximum rate, pulses are not output. The Count value will be set to the value of the Target without any pulses output. Pulses will be output again when the calculated pulse rate falls within the maximum possible rate.

1.1.3 Pulsed inputs

The first four digital channels on the WI-I/O-EX-1-S-11 module can be used as pulsed inputs. The maximum input pulse frequency is 1 KHz.

The pulse input channel calculates two register variables, each of which can be read by the master.

- The *Pulse Count* is a count of the pulses detected on the channel since the WI-I/O-EX powered up. The pulse input counts are 32-bit values (2 x 16-bit registers, a low and a high register), and wrap around to zero on overflow.
- The *Pulse Rate* is a measure of the rate of pulses detected on the channel. The pulse rate value is decimal 16,384 (hex 4000) for zero rate and decimal 49,152 (hex C000) for the *maximum rate* configured by the user. These zero and maximum values are the same as 0% and 100% used for analog values. (See section 5.4 for hex to decimal conversion.)

The maximum pulse input rate is set during configuration. The value is in pulses per minute and is limited to 60000 (1 KHz), the maximum rate capable of the module.

1.1.4 Analog inputs

The analog inputs on the WI-I/O-EX-1-S-12 can be connected as either grounded single-ended inputs or as floating differential inputs. The WI-I/O-EX-1-S-12 has eight grounded inputs or four floating inputs.

- Grounded single-ended inputs connect between the AIN terminal and the GND terminal.

- Floating differential inputs each take up two terminals. There are four differential pairs on the WI-I/O-EX-1-S-12: [AIN1-AIN2], [AIN3-AIN4], [AIN5-AIN6], [AIN7-AIN8]. For example, the first input is connected to terminals AIN1 (positive) and AIN2 (negative).

The two types of input cannot be mixed - all inputs must be either "grounded" or "floating".

Inputs can also be selected as mA current, or voltage input - all inputs must be the same, either all current or all voltage. The scale of each analog input is chosen during hardware configuration, with scale options as follows:

Voltage input scale options: [0 to 5V], [0 to 10V], [1 to 5V]
Current input scale options: [0 to 10mA], [0 to 20mA], [4 to 20mA]

For compatibility with E-Series modules, 4-20mA current is recommended. See section 4.4 for more information on compatibility.

The values on the analog input are decimal 16,384 (hex 4000) for minimum signal (0%) and decimal 49,152 (hex C000) for maximum (100%).

The analog channel will measure over-scale, up to 150% which will have value 65,536 (hex FFFF). For 4-20mA signals, the channel will measure under-scale down to 0mA which has a value of 8,192 (hex 2000). (See section 5.4 for hex to decimal conversion.)

The WI-I/O-EX-12 provides a 24V analog loop supply ("ALS") for powering analog loops.

1.1.5 Analog outputs

The WI-I/O-EX-1-S-13 has eight analog output channels and can be configured to output voltage or current. For current signals, "source" or "sink" can be selected. The scale of each analog output is specified during configuration, with scale options as follows:

Voltage output scale options: [0 to 5V], [0 to 10V], [1 to 5V]
Current output scale options: [0 to 10mA], [0 to 20mA], [4 to 20mA], source or sink

- Voltage outputs are measured with respect to the ground terminal.
- Current source outputs are measured with respect to the ground terminal.
- Current sink outputs are measured with respect to the 24V "ALS" terminal.

Writing to the output register by the master produces the analog output. Minimum to maximum signals (0 – 100%) are produced by register values from decimal 16,384 to 49,152 (hex 4000 - C000). (See section 5.4 for hex to decimal conversion.)

The analog channel can output over-scale, up to 150% corresponding to register value 65,536 (hex FFFF). For 4-20mA signals, the channel can output under-scale down to 0mA from a register value of 8,192 (hex 2000) or less. Note that the over-scale output is limited by the maximum levels capable of the WI-I/O-EX module (12V or 24mA).

1.1.6 Communications

The WI-I/O-EX modules have two communication ports: RS232 and RS485. The RS485 port communicates using E-Series protocol. Both ports support ModBus protocol.

The RS232 port is intended for configuration. The RS485 port is intended for normal operation and can be used in a multi-drop setup.

There are two address switches on the base of the module. Setting both address switches to 00 configures the module to use E-Series protocol on the RS485 port. When the switches are set within the range 01-99, the module uses ModBus protocol on the RS485 port, with the ModBus address defined by the switches. Whenever these address switches are changed the unit should be reset by disconnecting power.

When using E-Series protocol, the port settings are fixed at 9600 baud, 8 data bits, no parity, 1 stop bit.

The ModBus communications settings are configurable as follows:
ModBus type: RTU, ASCII with 8 data bits, ASCII with 7 data bits. (Note that the configuration software only supports ModBus RTU. A ModBus Master can select ASCII protocol by writing to the appropriate register. See Appendix A.)
Baud rate: 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, 76800, 115200
Parity: none, odd, even
Stop bits: 1 or 2.

The modules are fitted with a termination switch for the RS485. Set this switch only on the last module in a multi-drop RS485 configuration.

The WI Series software is used to configure the WI-I/O-EX modules as part of a network. The hardware set-up for items such as expected pulse rates and analog signals is also available through this software.

When used as a ModBus-only device, stand-alone configuration software (cfg_WI-I/O-EX_Vx.xx.exe) is available to set up the modules. All required software may be downloaded from the Weidmuller website (http://wireless.weidmuller.com).

2 Installation

All connections to the module should be SELV only. Normal 110/220/240V mains supply should not be connected to any input terminal of the module.

2.1 General installation

Several WI-I/O-EX modules may be connected to one master via RS485 multi-drop connection as shown in Figure 2-1. Ensure there is good grounding between the WI-I/O-EX units and the master. A 2.5 mm^2 / 12 gauge earth wire is recommended.

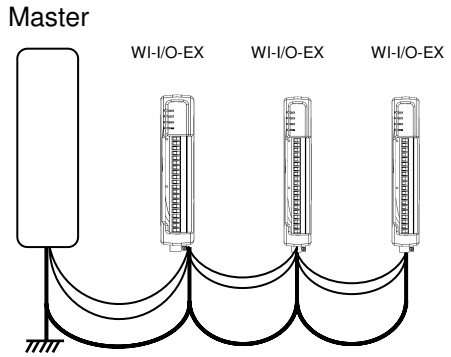


Figure 2-1: Several WI-I/O-EX units connected to a master.

2.1.1 Power Connection

The WI-I/O-EX modules require a *10.8-30 VDC* ** power supply. This is supplied to the 4-way connector, shown in Figure 2-2.

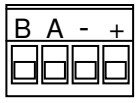


Figure 2-2: Power and RS485 connector. Connect *10.8-30 VDC* to + and earth to -. Connect RS485 to B and A.**

***** Model Dependent. Check rear label for actual operating voltages***

2.1.2 Address Switches

The address switches are found on the bottom panel of the module, as shown in Figure 2-3. If you are using the WI-I/O-EX module with other modules WI-I/O 9, WI-MOD-9-E and WI-MOD-E modules), the address switches must be set to “00”. This enables E-Series protocol mode.

If you are using a ModBus Master device, ensure each WI-I/O-EX connected to the same ModBus master has a unique ModBus address.

Note that the module must be reset after changing the address switches.

You can connect to an WI-GTWY-9-MD1 Module using either MODBUS protocol or E-Series protocol. E-Series protocol is easier to set up, and we recommend using this protocol for most applications.

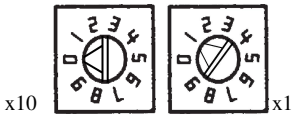


Figure 2-3: Address switches. The address shown is 01.

Connect the RS485 B and A wires to the 4-way connector shown previously in Figure 2-2. An RS485 termination switch is provided. Terminate the last WI-I/O-EX module in the multi-drop setup as shown in Figure 2-4.

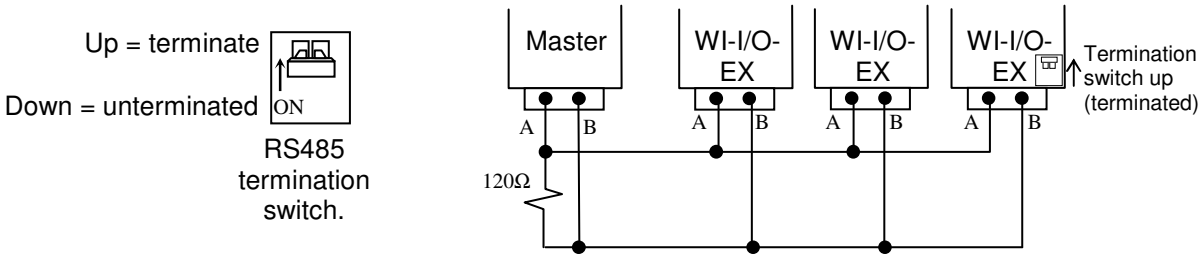


Figure 2-4: RS485 multi-drop connection and termination (only use external termination for the master if it does not have internal termination).

2.2 Signal Connections

All connections to the module should be SELV only. Normal 110/220/240V mains supply should not be connected to any input terminal of the module.

2.2.1 Digital Inputs (and Pulsed Inputs)

The WI-I/O-EX-1-S-11 supports 16 digital signals, and the WI-I/O-EX-1-S-12 and WI-I/O-EX-1-S-13 support 8 digital signals. Additionally, digital inputs DIO1-4 on the WI-I/O-EX-1-S-11 operate as pulse inputs.

Digital output signals share the same terminals as the Digital input signals, marked DIO1-8, and DIO1-16 on the WI-I/O-EX-1-S-11 module.

A digital input is activated by connecting to EARTH, either by voltage-free contact or by a transistor switch. Refer to Figure 2-5:

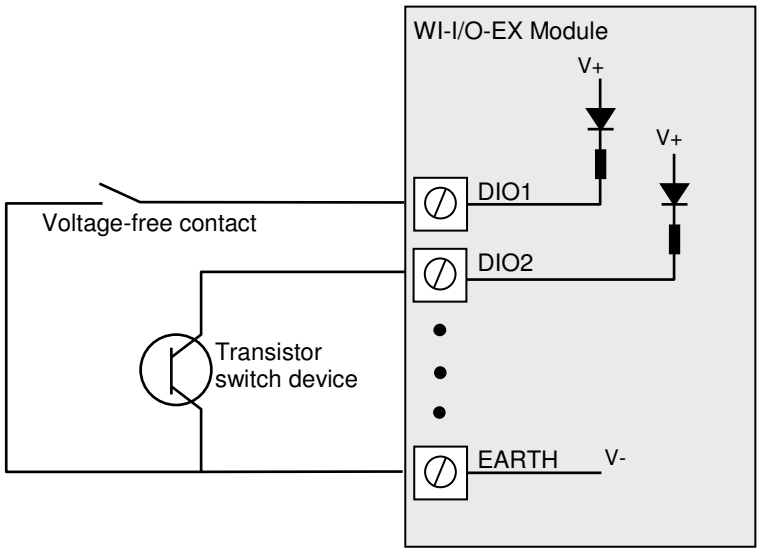


Figure 2-5: Connection of digital inputs.

2.2.2 Digital Outputs (and Pulsed Outputs)

The WI-I/O-EX-1-S-11 supports up to 16 digital outputs, shared with the digital input function on the same terminals. The WI-I/O-EX-1-S-12 and WI-I/O-EX-1-S-13 both provide 8 digital output signals. These signals are marked DIO1-8, and DIO1-16 for the WI-I/O-EX-1-S-11. On all WI-I/O-EX modules, DIO1-8 can also operate as pulsed outputs.

When active, digital outputs provide a transistor switch to EARTH. To connect a digital output, refer to the diagram in Figure 2-6. A bypass diode is recommended to protect against switching surges for inductive loads such as relay coils.

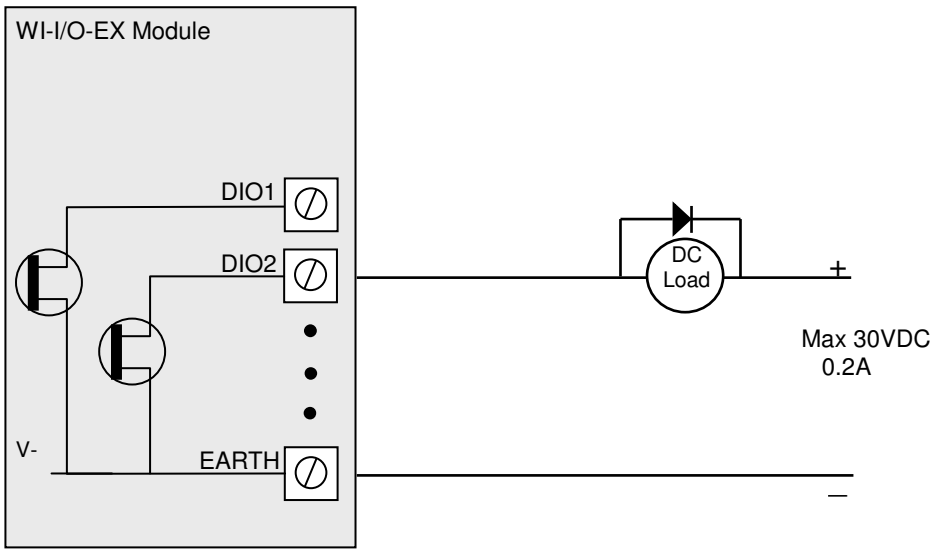


Figure 2-6: Connection of digital outputs.

Note that digital outputs will only switch DC circuits, with maximum voltage 30VDC.

2.2.3 Analog Inputs

The WI-I/O-EX-1-S-12 provides eight grounded single-ended or four floating differential analog inputs. These provide measurement of voltage signals (0-10V) or current (0-20 mA) signals. An internal 24V analog loop supply (ALS) is generated for current loops.

Refer to Section 4.4 for detail on configuring single-ended, differential, current-mode or voltage mode inputs.

2.2.3.1 Grounded Single-Ended mA Inputs

Single-ended current inputs allow twice as many inputs as the differential mode. This mode is useful when the sensor loop can be grounded to the WI-I/O-EX module. Devices may also be powered by the 24V supplied by the WI-I/O-EX. Refer to Figure 2-7:

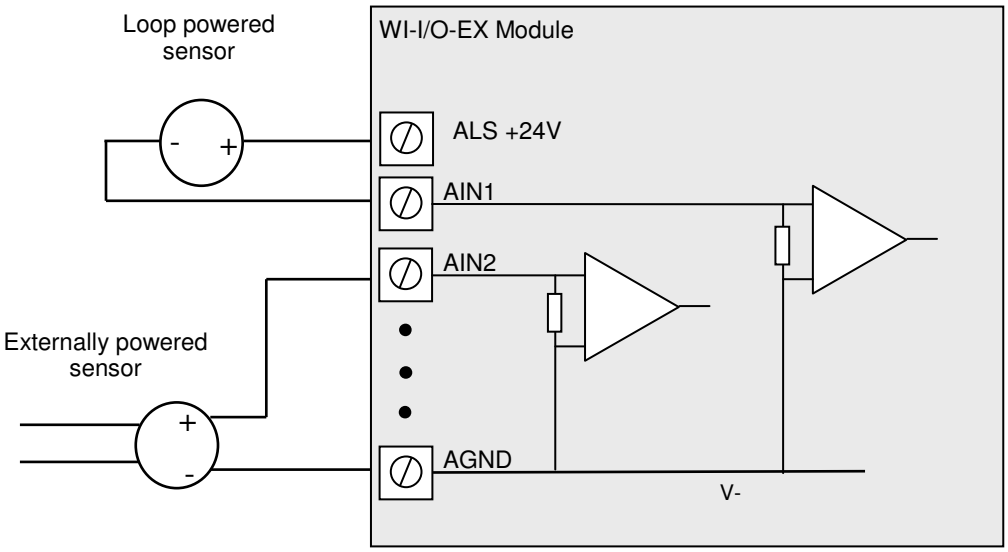


Figure 2-7: Connection for single-ended current inputs. Transducers may be externally powered or powered by the WI-I/O-EX +24V loop supply (ALS).

Note:

- The module is configured at the factory for this type of input
- To change the input configuration, refer to section 4.4

2.2.3.2 Floating Differential Mode mA Inputs

Differential mode current inputs should be used when measuring a current loop which cannot be connected to earth or ground. This allows the input to be connected anywhere in the current loop. Common mode voltage can be up to 27VDC.

Up to four loops can be connected, to terminal pairs [AIN1-AIN2], [AIN3-AIN4], [AIN5-AIN6], [AIN7-AIN8] - the former terminal is positive and the latter negative. The diagram in Figure 2-8 indicates how to connect devices for differential mode current inputs.

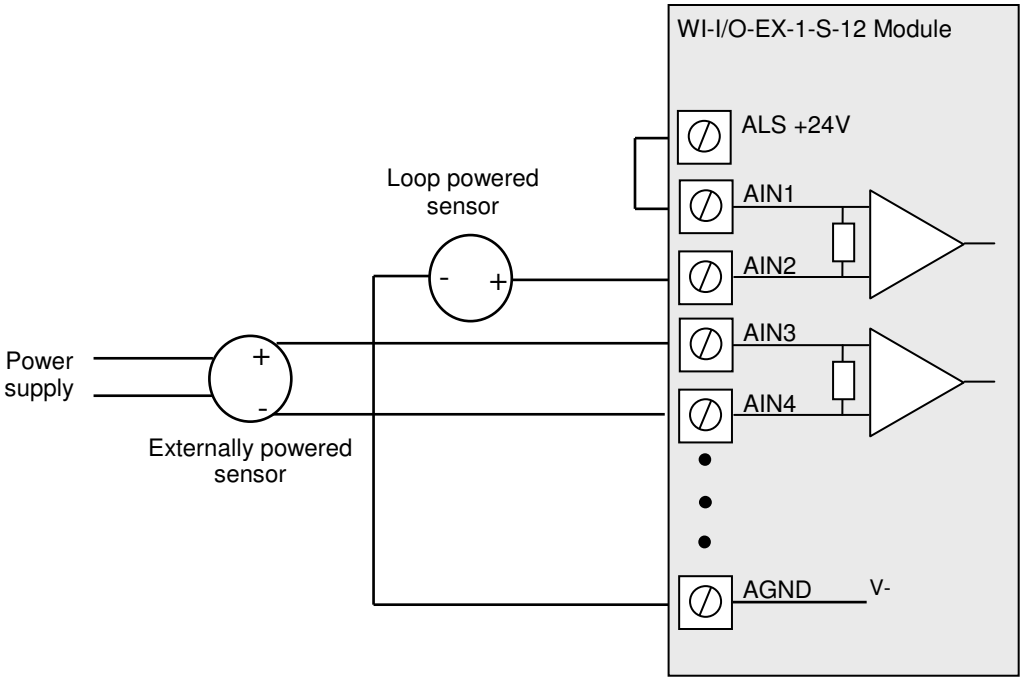


Figure 2-8: Connections for differential current inputs.

Note:

- The module configuration needs to be changed for this type of input
- To change the input configuration, refer to section 4.4

2.2.3.3 Floating Differential Voltage Inputs

Differential voltage inputs allow a voltage to be measured when it cannot be referenced to earth or ground. The diagram in Figure 2-9 shows how to connect differential voltage inputs. The module has a 27V common mode input range.

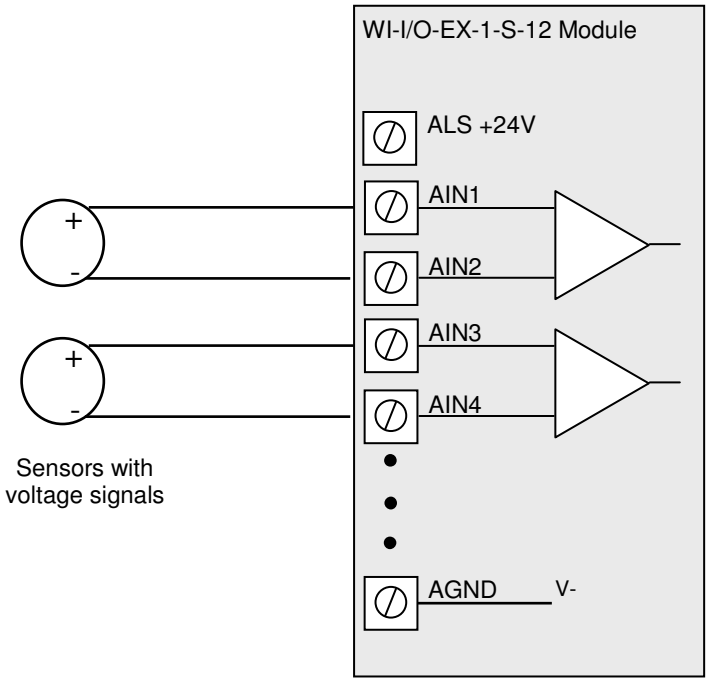


Figure 2-9: Connection for differential voltage input mode.

Note:

- The module configuration needs to be changed for this type of input
- To change the input configuration, refer to section 4.4

2.2.3.4 Single-ended Voltage Input

Single-ended voltage inputs allow twice as many inputs as differential mode. This mode is useful when one end of the input voltage can be connected to the ground of the WI-I/O-EX module. Figure 2-10 shows connections for single-ended voltage input.

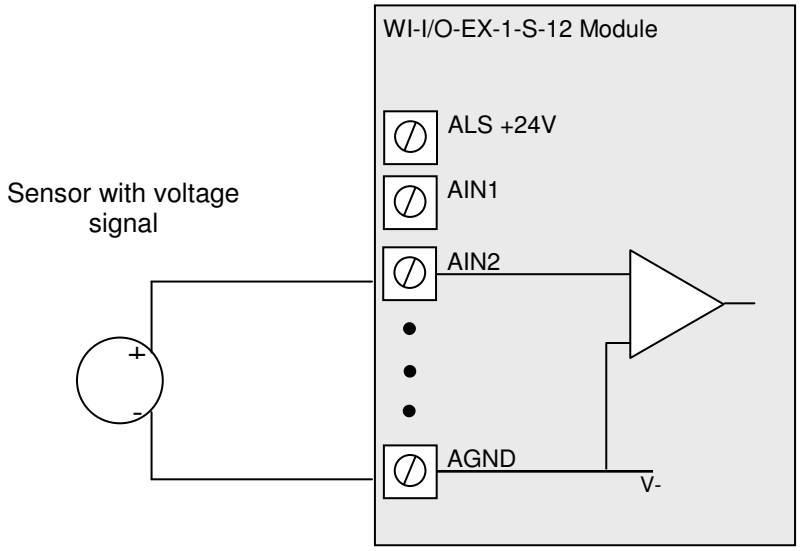


Figure 2-10: Connection for single-ended voltage input.

Note:

- The module configuration needs to be changed for this type of input
- To change the input configuration, refer to section 4.4

2.2.4 Analog Outputs

The WI-I/O-EX-1-S-13 provides eight analog outputs. These may be configured as voltage or current outputs. The current output may be selected as “sink” or “source” current.

Refer to Section 4.5 for detail on configuring analog outputs.

2.2.4.1 Current Output

Current output mode may be configured for current source or current sink. Figure 2-11 shows the connections for current source mode. Figure 2-12 shows the connections for current sink.

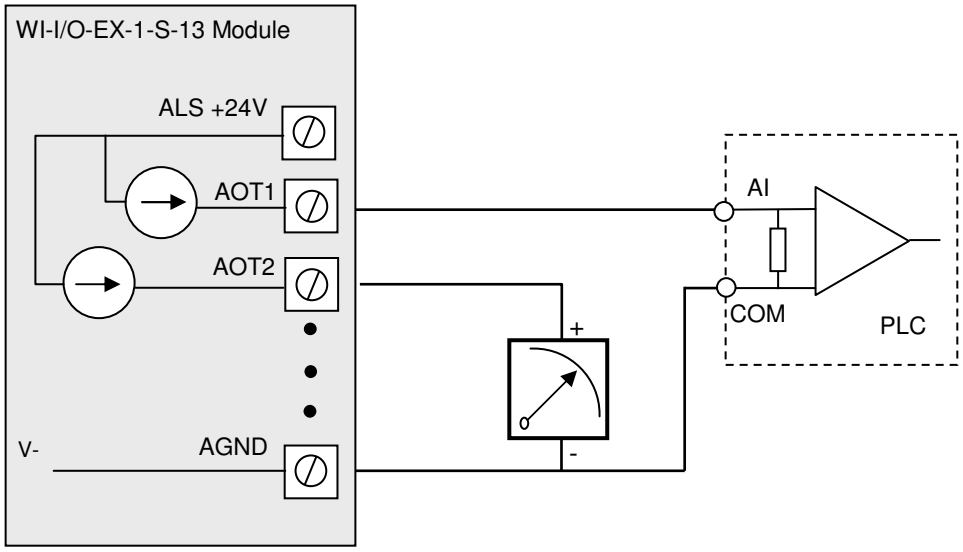


Figure 2-11: Connection for current source output.

Note:

- The module is configured at the factory for this type of output connection
- To change the input configuration, refer to section 4.5

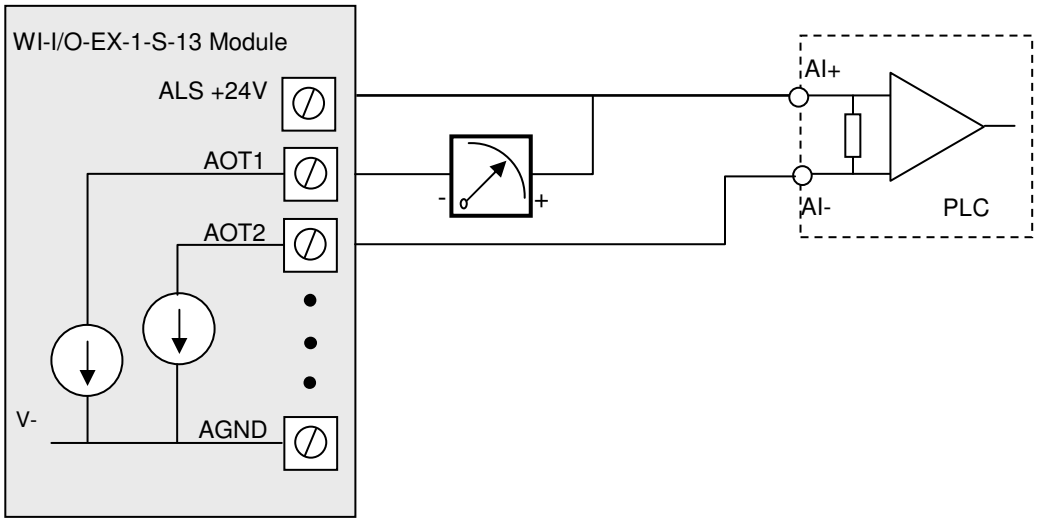


Figure 2-12: Connection for current sink output.

Note:

- The hardware configuration needs to be changed for this type of output connection
- To change the hardware configuration, refer to section 4.5

2.2.4.2 Voltage Output

Voltage output mode produces a voltage referenced to the module's AGND. Figure 2-13 shows the connection for voltage output configuration.

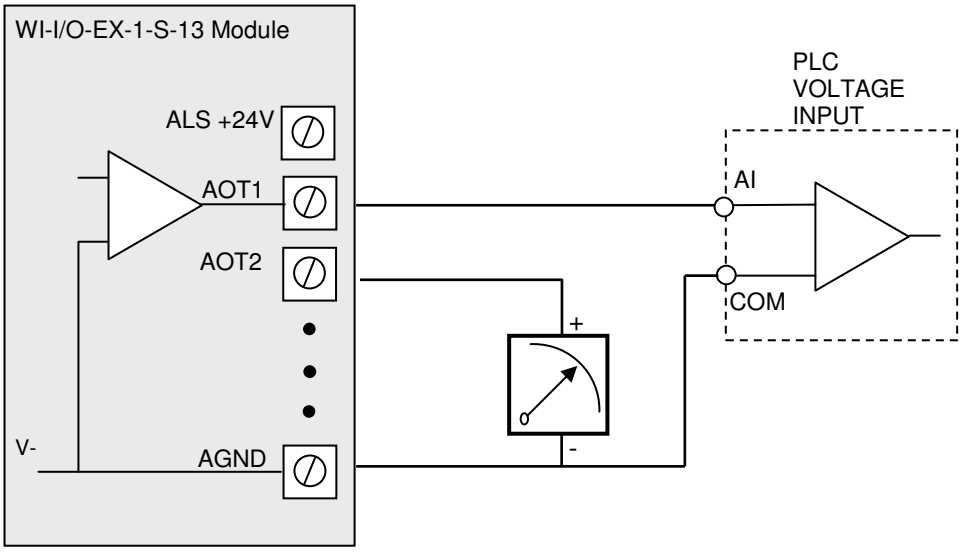


Figure 2-13: Connection for voltage output configuration.

3 Configuration

Use the WI Series Configuration utility to configure the WI-I/O-EX module to communicate to WI-I/O 9, WI-MOD-9-E and WI-MOD-E modules.

- If you want to communicate using ModBus, then simply set the address using the address switches on the bottom of the module. Refer to section 2.1.2 for details on setting the address switches
- Ensure the Address switches are set to "00" for E-Series protocol mode. Refer to section 2.1.2 for details on setting the address switches.

The WI Series Configuration utility allows you to configure systems consisting of a mixture of Module types. You can download this software from the Weidmuller web site at (http://wireless.weidmuller.com)

3.1 Add a radio module to connect the WI-I/O-EX to the radio network.

To configure a Serial module you must first create configuration for a radio module – For example a WI-I/O-9 module. This is the radio module you plan to connect the serial module to.

- Refer to your radio module user manual for an explanation on how to create the radio module configuration.

3.2 Add the Serial Module

Once you have created the new radio module configuration, you can add the serial module. Select the new radio module that you want to connect the WI-I/O-EX serial module to, and select the "Serial Units" item. Select "Add a new Serial Unit" to create the new configuration, or select "Load a New Serial Unit" to load the configuration from an existing module. See Figure 3-1.

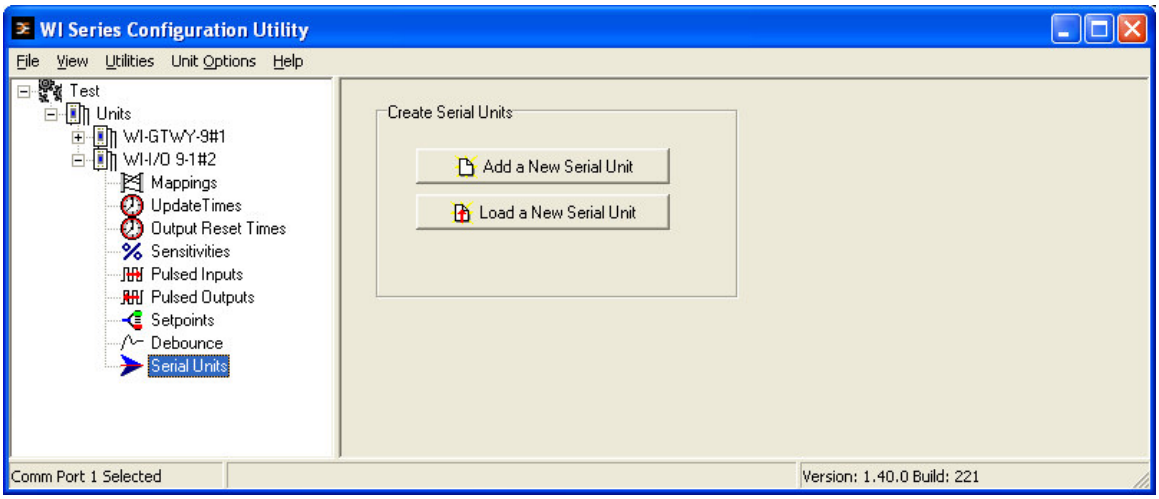


Figure 3-1: Configuration of WI-I/O-EX modules using Configuration Utility.

When you select "Add a new Serial Unit" you will need to select the unit type. Select the correct module type here.

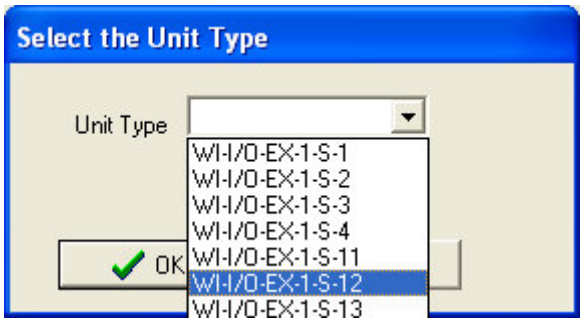
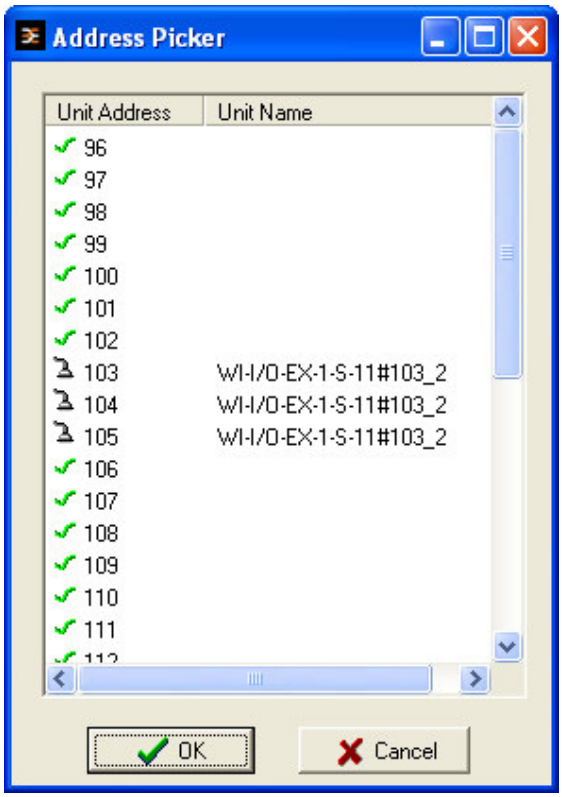


Figure 3-2: Select the unit type.

Finally, you will be prompted to select the module address. You can choose to allow the configuration software to select an unused address for you, or you can select the module address manually.

- Serial Module address must be in the range 96 to 127.
- Every serial module that is connected to the same radio module needs a separate address.
- You can use the same address on two different serial modules if they are connected to different radio modules.



Once you have added the new module you can configure it in the same way as for 105 series modules.

For more information on configuring these modules using the WI Series software, refer to the WI-I/O-9 user manual.

4 Hardware Configuration

Hardware Set-up allows the WI-I/O-EX hardware function to be adjusted to suit the application. To configure the hardware settings, you need:

- Access to the DIP switches under the Analog Configuration Panel (refer Figure 1-1: WI-I/O-EX unit with significant parts labeled.)
- Configuration Software to run on your PC.

Configuration of the WI-I/O-EX modules is performed by either the dedicated WI-I/O-EX configuration software (cfg_WI-I/O-EX_Vx.xx.exe), or by the WI Series configuration software (from the Utilities / Advanced - SXM menu).

4.1 Connecting to the WI-I/O-EX module

To use the configuration software, perform the following steps:

- Connect the WI-I/O-EX to the PC COM port with a standard serial cable (straight-through, DB9 female to DB9 male. See Appendix for wiring.)
- Set the address switches to 00
- Supply power to the WI-I/O-EX via the "+" and "-" terminals on the bottom of the module (10.8-30 VDC **).

  ***** Model Dependent. Check rear label for actual operating voltages***

- Start the configuration software on your PC or laptop (cfg_WI-I/O-EX_Vx.xx.exe)

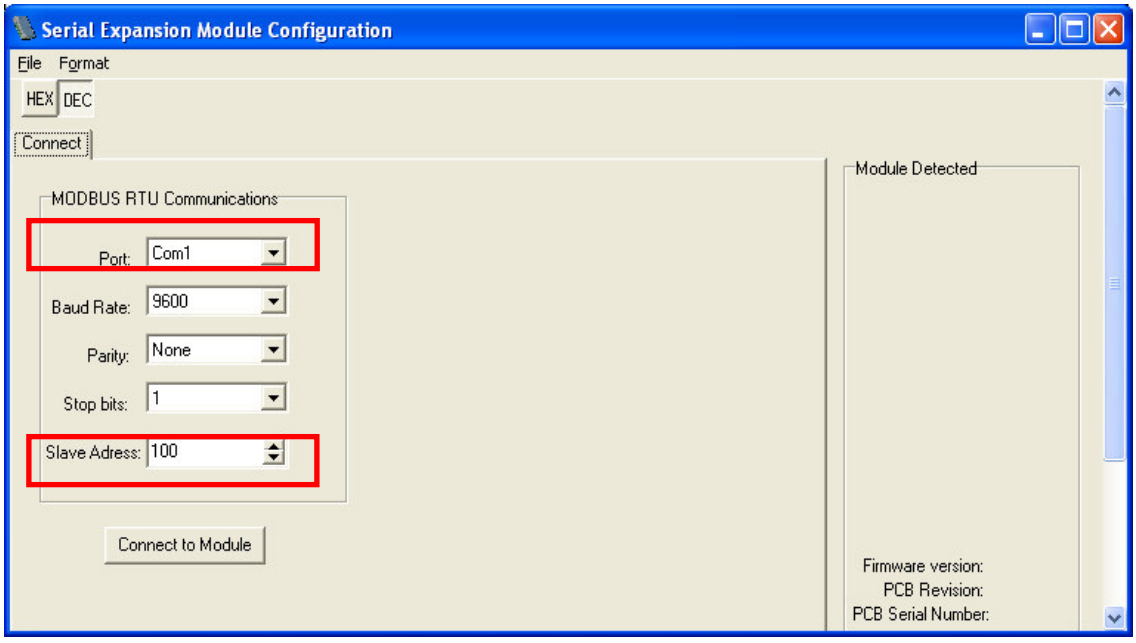


Figure 4-1: Main configuration screen.

- Set the "Port" setting to match the computer com port you have connected to.
- Set the "Slave Address" to match the address switch setting of the WI-I/O-EX. If you are using address "00" for E-Series Protocol, set the Slave Address to 100.
- Set the communications parameters. The default communications parameters are:

  Baud rate: 9600
  Parity: NONE
  Stop bits: 1

Click the button labeled *Connect to WI-I/O-EX*.

If you are unable to communicate with the WI-I/O-EX, refer to Appendix C: Comms Recovery.

If connection has been successful, several folder tabs will become available, depending on the module type. The panel on the right-hand side of the form shows the WI-I/O-EX detected and its settings.

4.2 Configuration common to all modules

4.2.1 Communications

Select the *Comms* folder tab. This page allows you to change the communications settings of the WI-I/O-EX.

These settings are applied to both the RS-232 configuration port and to the RS-485 ModBus interface port.

Choose the required settings, then click *Set comms*. You will need to power off / on the WI-I/O-EX for the new settings to take effect.

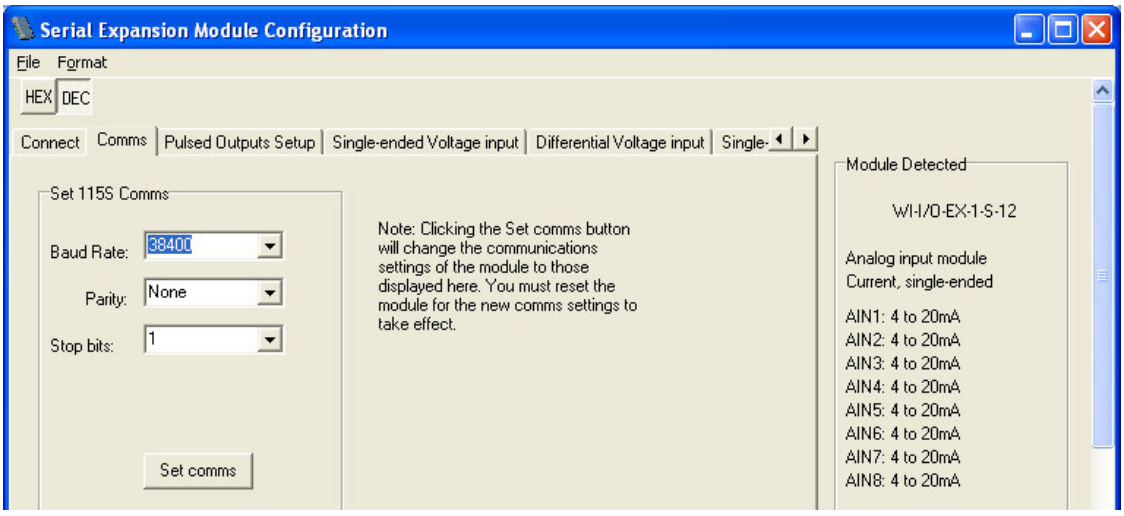

Serial Expansion Module Configuration
File Format
HEX DEC
Connect Comms Pulsed Outputs Setup Single-ended Voltage input Differential Voltage input Single-
Set 115S Comms
Baud Rate: 38400
Parity: None
Stop bits: 1
Set comms
Note: Clicking the Set comms button will change the communications settings of the module to those displayed here. You must reset the module for the new comms settings to take effect.
Module Detected
WI-I/O-EX-1-S-12
Analog input module
Current, single-ended
AIN1: 4 to 20mA
AIN2: 4 to 20mA
AIN3: 4 to 20mA
AIN4: 4 to 20mA
AIN5: 4 to 20mA
AIN6: 4 to 20mA
AIN7: 4 to 20mA
AIN8: 4 to 20mA

Figure 4-2: Communications configuration screen.

Note that you will need to change the connection settings on the "Connect" page, and re-connect to the WI-I/O-EX.

4.2.2 Pulsed outputs

Choose the folder tab labeled *Pulsed Outputs Setup*, as shown in Figure 4-3.

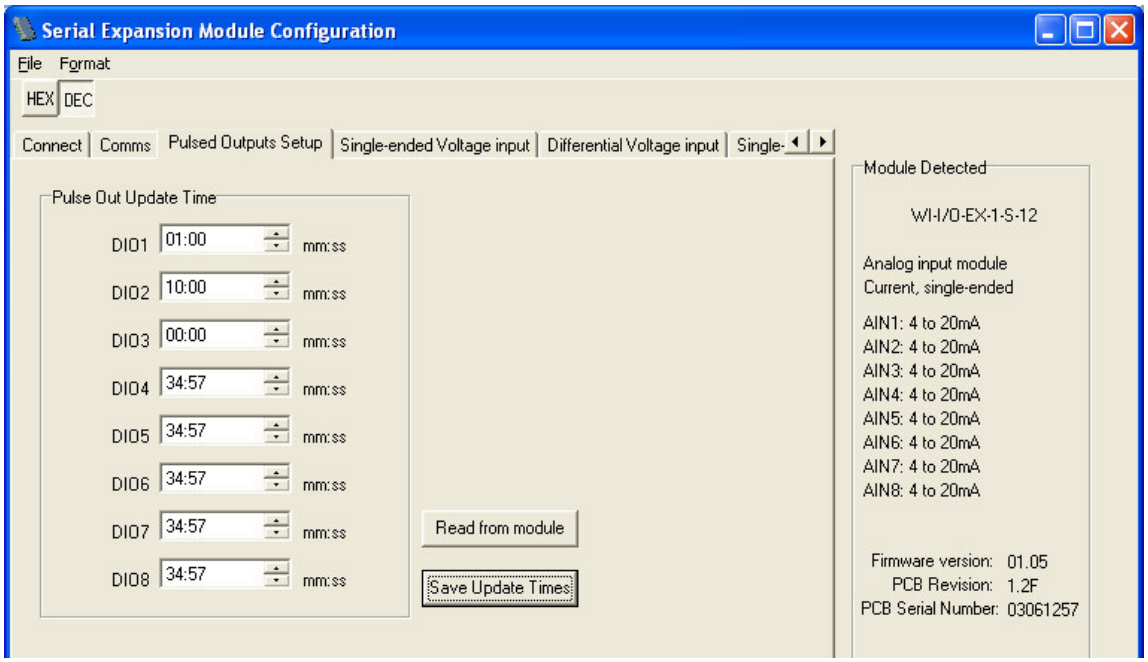


Figure 4-3: Pulsed outputs setup page for a WI-I/O-EX-11. The pulsed outputs are available on all models.

Clicking the button *Read from WI-I/O-EX* will read the pulse out update times from the WI-I/O-EX and display them on the form.

The Pulse Out Update Times should be set to the approximate interval at which the WI-I/O-EX will receive updates to its pulse out target register. The pulse output circuitry will attempt to generate pulses at a rate that will reach the target pulse count within the update time. For example, if the ModBus master unit is configured to send the register value for the pulse output channel every 1 minute, then the Update Time should be set to 1 minute.

The maximum allowed pulse out update time is 34 minutes 57 seconds. Set the update times for each channel in hours, minutes, and seconds. An update time of zero will never produce any pulses.

After the update times have been set, click the *Save Update Times* button.

The pulse output feature can be tested on the C*heck* folder tab (refer section 5).

4.3 WI-I/O-EX-11 configuration

4.3.1 Pulsed Inputs

Choose the *Pulse Inputs Setup* page, as shown in Figure 4-4.

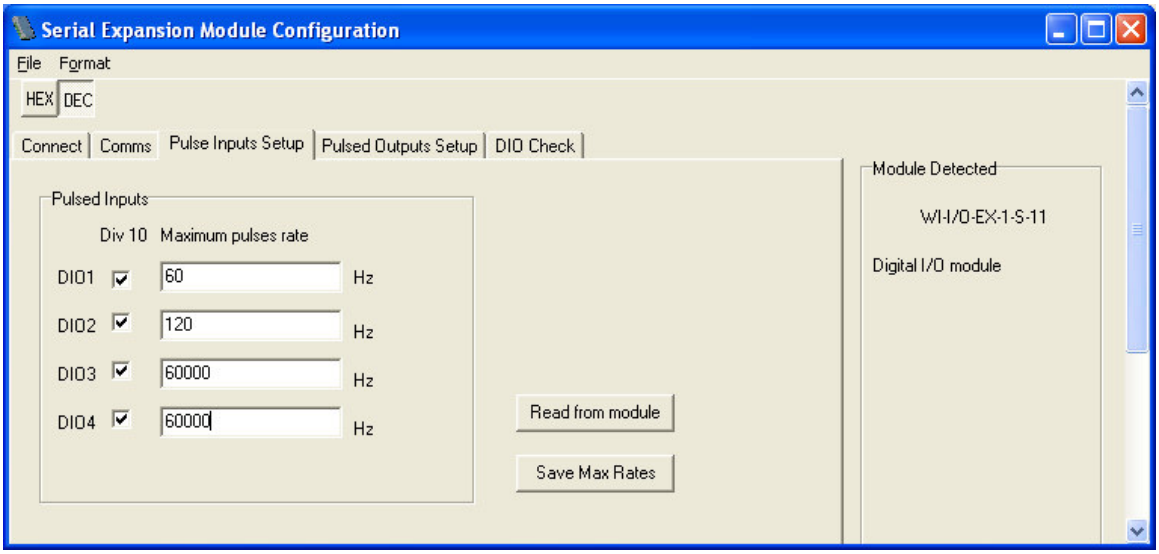


Figure 4-4: Pulse inputs setup. Only available on a WI-I/O-EX-11 module.

Clicking the *Read from WI-I/O-EX* button reads the existing maximum pulse rate settings from the WI-I/O-EX and displays them on the form.

If pulse rate is to be used, the maximum pulse input rate must be set. The pulse rate value is calculated as a fraction of the maximum pulse input rate. Specify the maximum pulse input rate in pulses per minute. The highest allowable pulse input rate is 60000 pulses per minute, or 1kHz.

Once the maximum pulse rates are specified, click the *Save Max Rates* button to save the data to the WI-I/O-EX module.

The pulse input feature can be tested on the *DIO Check* page (refer section 5.1).

4.4 WI-I/O-EX-12 configuration

4.4.1 Voltage input

Voltage inputs may be selected in the scales 0 to 5V, 0 to 10V, or 1 to 5V. For each scale, the minimum to maximum signal levels are represented by 4000 hex to C000 hex. Table 4-1 shows how the WI-I/O-EX-12 voltage readings translate to outputs in other wireless products.

WI-I/O-EX-12 Voltage scale	**WI-I/O-EX-12 Input voltage (V)**	**WI-GTWY Register value (hex)**	**WI-I/O 9-1 Output current (mA)**	**WI-I/O 9-3 Output current (mA)**
0 to 5V	0	4000	4	4
	5	C000	20	20
0 to 10V	0	4000	4	4
	10	C000	20	20
1 to 5V	0	2000	0.5*	0
	1	4000	4	4
	5	C000	20	20

Table 4-1: Compatibility of WI-I/O-EX-12 voltage inputs with other products.
***Reduced accuracy for less than 4mA in WI-I/O-9-1.**

4.4.1.1 Single-ended voltage input

If the WI-I/O-EX-1-S-12 is to measure voltage with respect to ground, choose the Single-ended voltage input page, as shown in Figure 4-5.

> Remove the access panel from the front of the WI-I/O-EX-1-S-12 case to gain access to the dip switches. Replace the access panel after setting the switches.

Set the switches according to the picture shown. The unit should be orientated with the 20-way connector towards you.

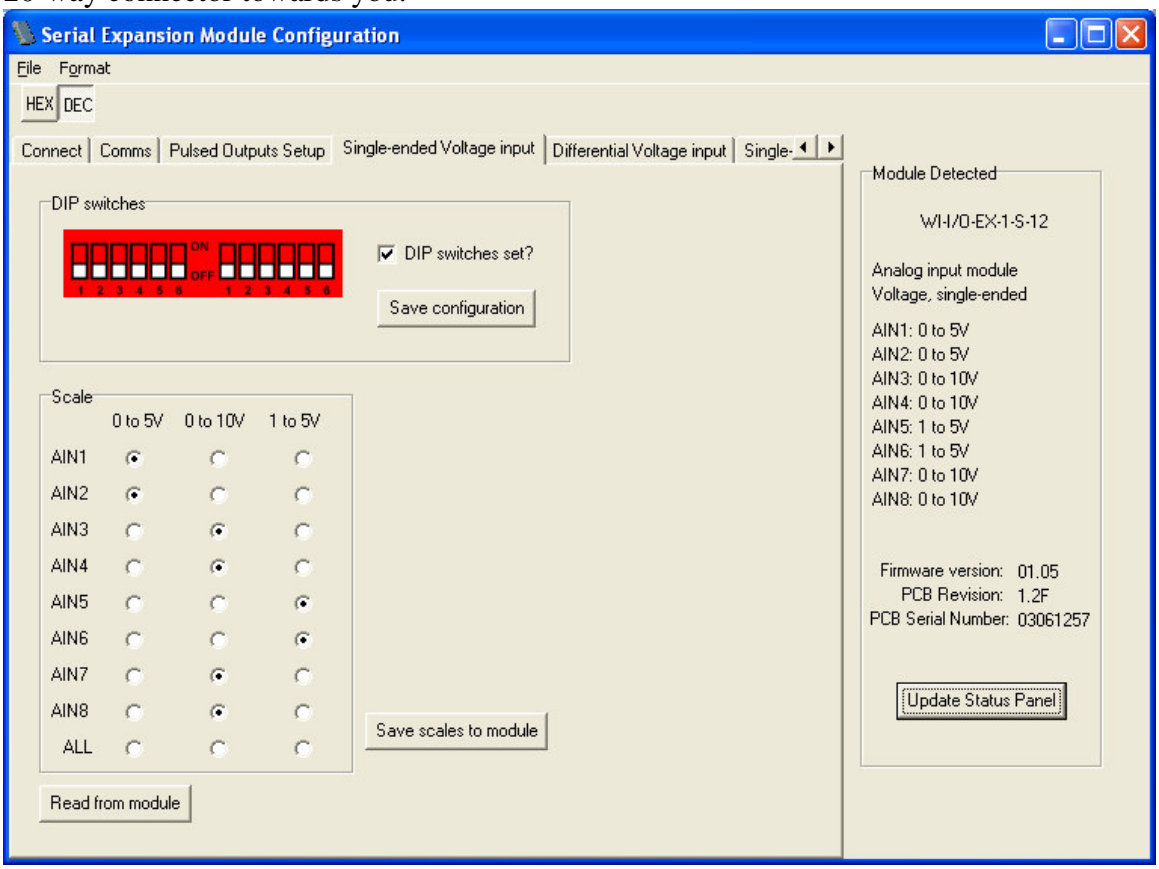


Figure 4-5: Setup page for single-ended voltage input.

Once the dip switches on the unit are set, tick the checkbox on the form, and click *Save configuration*. Check the *WI-I/O-EX Detected* panel to ensure that the analog mode has been updated (to Voltage, single-ended).

Clicking *Read from WI-I/O-EX* will read the scales out of the unit (if any) and display them in the scales grid. Note that the dip switches should be set correctly for this result to be relevant.

Choose the desired scale for each channel in the *Scale* box. Click the *Save scales to WI-I/O-EX* button, and check that the scales are updated in the *WI-I/O-EX Detected* panel.

4.4.1.2 Differential voltage input

The WI-I/O-EX-1-S-12 can be configured to measure differential voltage. Neighbouring channels serve as reference voltages in this mode. The four differential pairs are: AIN1-AIN2, AIN3-AIN4, AIN5-AIN6, and AIN7-AIN8.

Choose the page to configure the WI-I/O-EX-1-S-12 for differential voltage input, as shown in Figure 4-6.

> Remove the access panel from the front of the WI-I/O-EX-1-S-12 case to gain access to the dip switches. Replace the access panel after setting the switches.

Set the switches according to the picture shown. The unit should be orientated with the 20-way connector towards you.

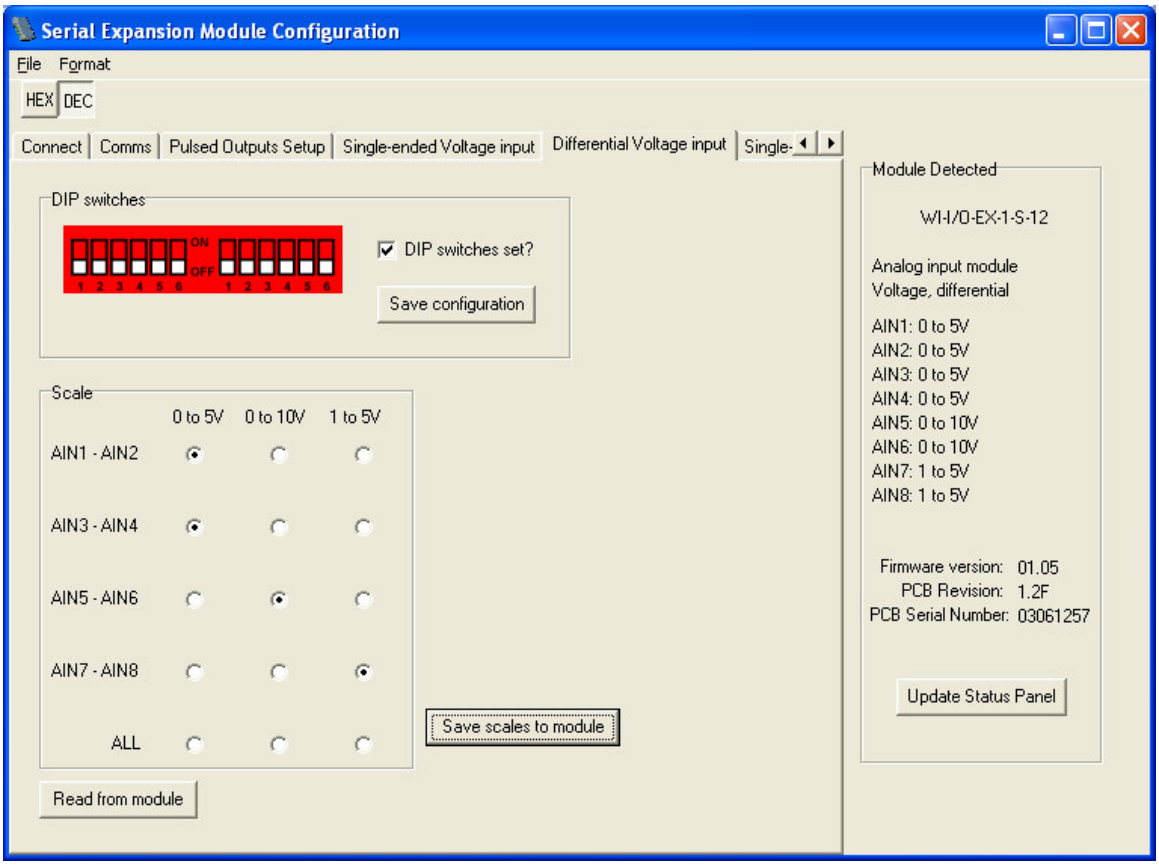


Figure 4-6: Setup page for differential voltage input.

Once the dip switches on the unit are set, tick the checkbox on the form, and click *Save configuration.* Check the *WI-I/O-EX Detected* panel to ensure that the analog mode has been updated (to Voltage, differential).

Clicking *Read from WI-I/O-EX* will read the scales out of the unit (if any) and display them in the scales grid. Note that the dip switches should be set correctly for this result to be relevant.

Choose the desired scale for each channel in the *Scale* box. Click the *Save scales to WI-I/O-EX* button, and check that the scales are updated in the *WI-I/O-EX Detected* panel.

4.4.2 Current input

Current inputs may be selected in the scales 0 to 10mA, 0 to 20mA, or 4 to 20mA. For each scale, the minimum to maximum signal levels are represented by 4000 hex to C000 hex. Table 4-2 shows how the WI-I/O-EX-12 current readings translate to outputs in other wireless products.

WI-I/O-EX-12 Current scale	WI-I/O-EX-12 Input current (mA)	WI-GTWY Register value (hex)	WI-I/O 9-1 Output current (mA)	WI-I/O 9-3 Output current (mA)
0 to 10mA	0 10	4000 C000	4 20	4 20
0 to 20mA	0 20	4000 C000	4 20	4 20
4 to 20mA	0 4 20	2000 4000 C000	0.5* 4 20	0 4 20

Table 4-2: Compatibility of WI-I/O-EX-12 current inputs with other products.
***Reduced accuracy for less than 4mA in WI-I/O 9-1.**

4.4.2.1 Single-ended current input

The WI-I/O-EX-1-S-12 can also measure current input. To measure current with respect to ground, choose the Single-ended current input page, as shown in Figure 4-7.

> Remove the access panel from the front of the WI-I/O-EX-1-S-12 case to gain access to the dip switches. Replace the access panel after setting the switches.

Set the switches according to the picture shown. The unit should be orientated with the 20-way connector towards you.

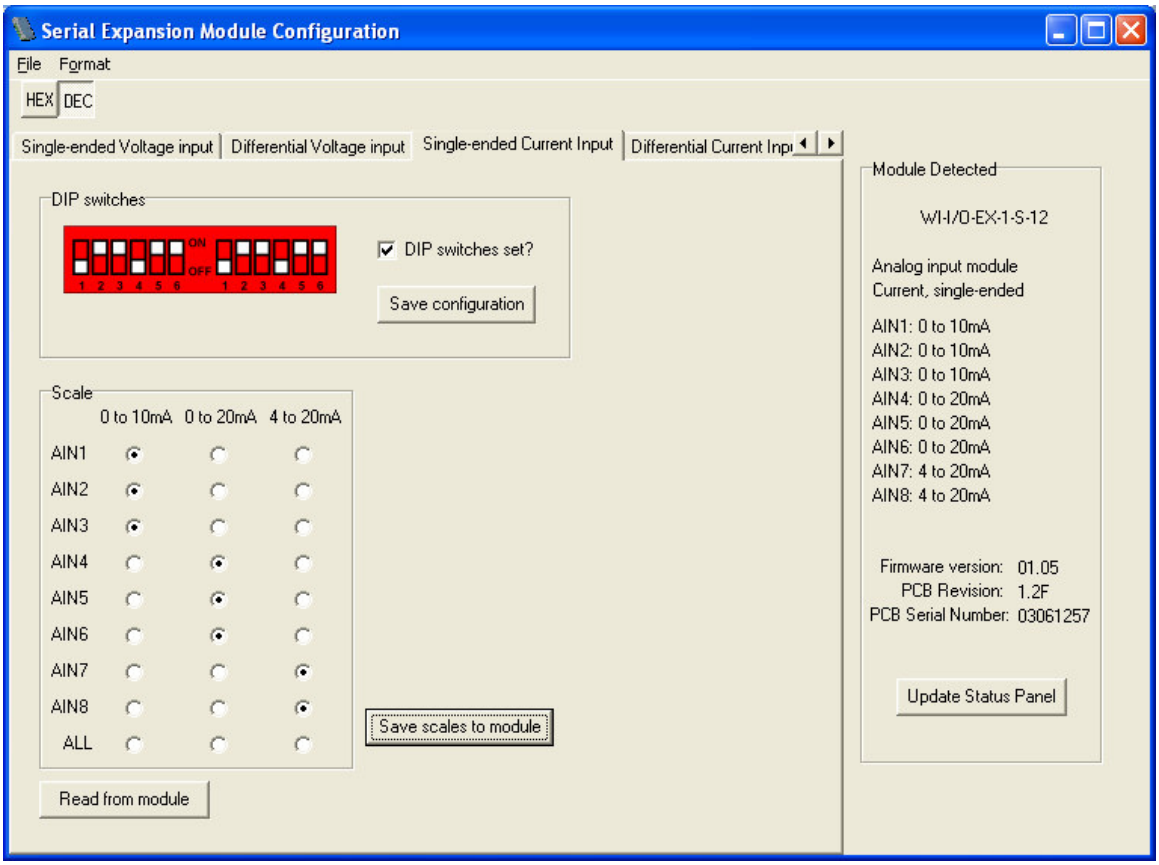


Figure 4-7: Setup page for single-ended current input.

Once the dip switches on the unit are set, tick the checkbox on the form, and click *Save configuration.* Check the *WI-I/O-EX Detected* panel to ensure that the analog mode has been updated (to Current, single-ended).

Clicking *Read from WI-I/O-EX* will read the scales out of the unit (if any) and display them in the scales grid. Note that the dip switches should be set correctly for this result to be relevant.

Choose the desired scale for each channel in the *Scale* box. Click the *Save scales to WI-I/O-EX* button, and check that the scales are updated in the *WI-I/O-EX Detected* panel.

4.4.2.2 Differential current input

The WI-I/O-EX-1-S-12 can be configured to measure differential current. The differential pairs are: AIN1-AIN2, AIN3-AIN4, AIN5-AIN6, AIN7-AIN8. To use this configuration, choose the differential current input page, as shown in Figure 4-8.

> Remove the access panel from the front of the WI-I/O-EX-1-S-12 case to gain access to the dip switches. Replace the access panel after setting the switches.

Set the switches according to the picture shown. The unit should be orientated with the 20-way connector towards you.

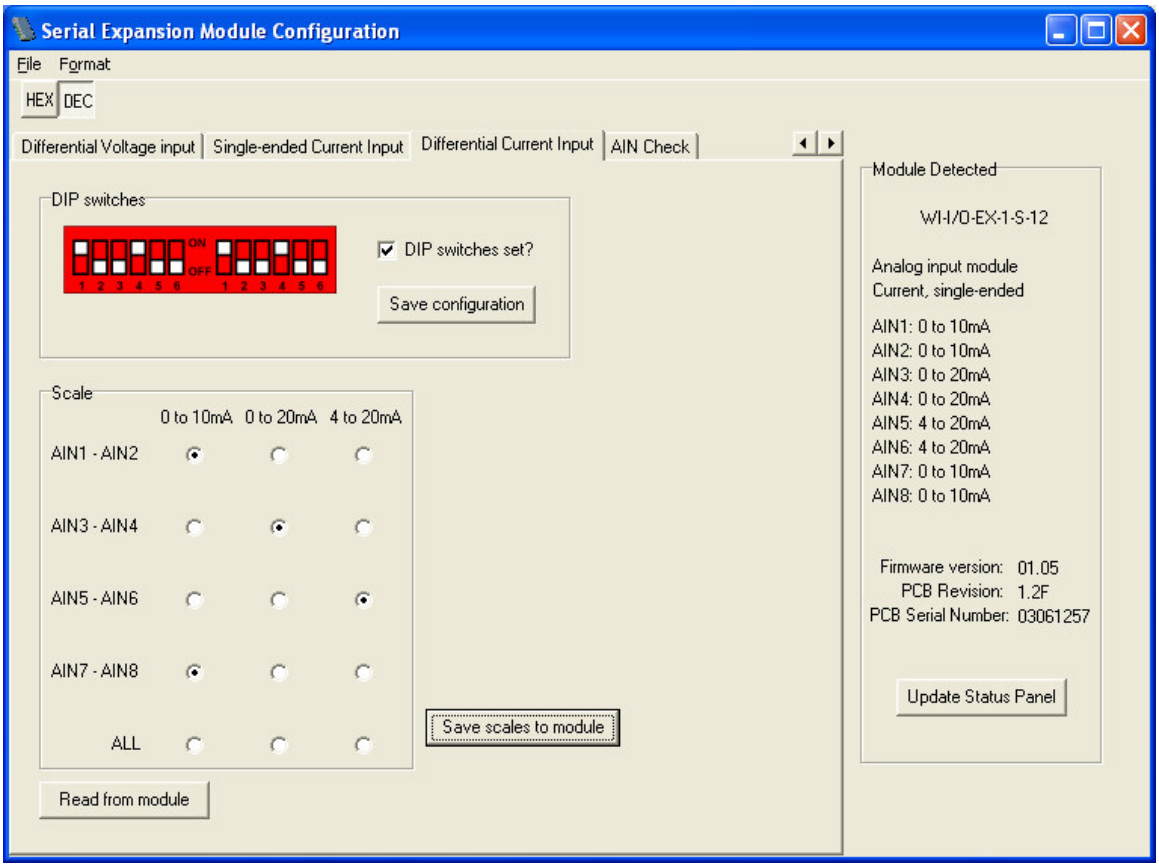


Figure 4-8: Setup page for differential current configuration.

Once the dip switches on the unit are set, tick the checkbox on the form, and click *Save configuration.* Check the *WI-I/O-EX Detected* panel to ensure that the analog mode has been updated (to Current, differential).

Clicking *Read from WI-I/O-EX* will read the scales out of the unit (if any) and display them in the scales grid. Note that the dip switches should be set correctly for this result to be relevant.

Choose the desired scale for each channel in the *Scale* box. Click the *Save scales to WI-I/O-EX* button, and check that the scales are updated in the *WI-I/O-EX Detected* panel.

4.5 WI-I/O-EX-1-S-13 configuration

4.5.1 Voltage output

Voltage outputs may be selected in the scales 0 to 5V, 0 to 10V, or 1 to 5V. For each scale, the minimum to maximum signal levels are represented by 4000 hex to C000 hex. Table 4-3 shows how signals from other wireless products translate to WI-I/O-EX-13 voltage levels.

WI-I/O-EX-1-S-13 Voltage scale	**WI-I/O 9-1 Input current (mA)**	**WI-I/O 9-2 Input current (mA)**	**WI-GTWY Register value (hex)**	**WI-I/O-EX-1-S-13 Output voltage (V)**
0 to 5V	4 20	4 20	4000 C000	0 5
0 to 10V	4 20	4 20	4000 C000	0 10
1 to 5V	N/A* 2* 4 20	0 2 4 20	2000 3000 4000 C000	0 0.5 1 5

Table 4-3: Compatibility of other products with WI-I/O-EX-13 voltage outputs.
***Reduced accuracy for less than 4mA in WI-I/O 9-1.**

To configure the WI-I/O-EX-1-S-13 for voltage output, select the page as shown in Figure 4-9.

> Remove the access panel from the front of the WI-I/O-EX-1-S-13 case to gain access to the dip switches. Replace the access panel after setting the switches.

Set the switches according to the picture shown. The unit should be orientated with the 20-way connector towards you.

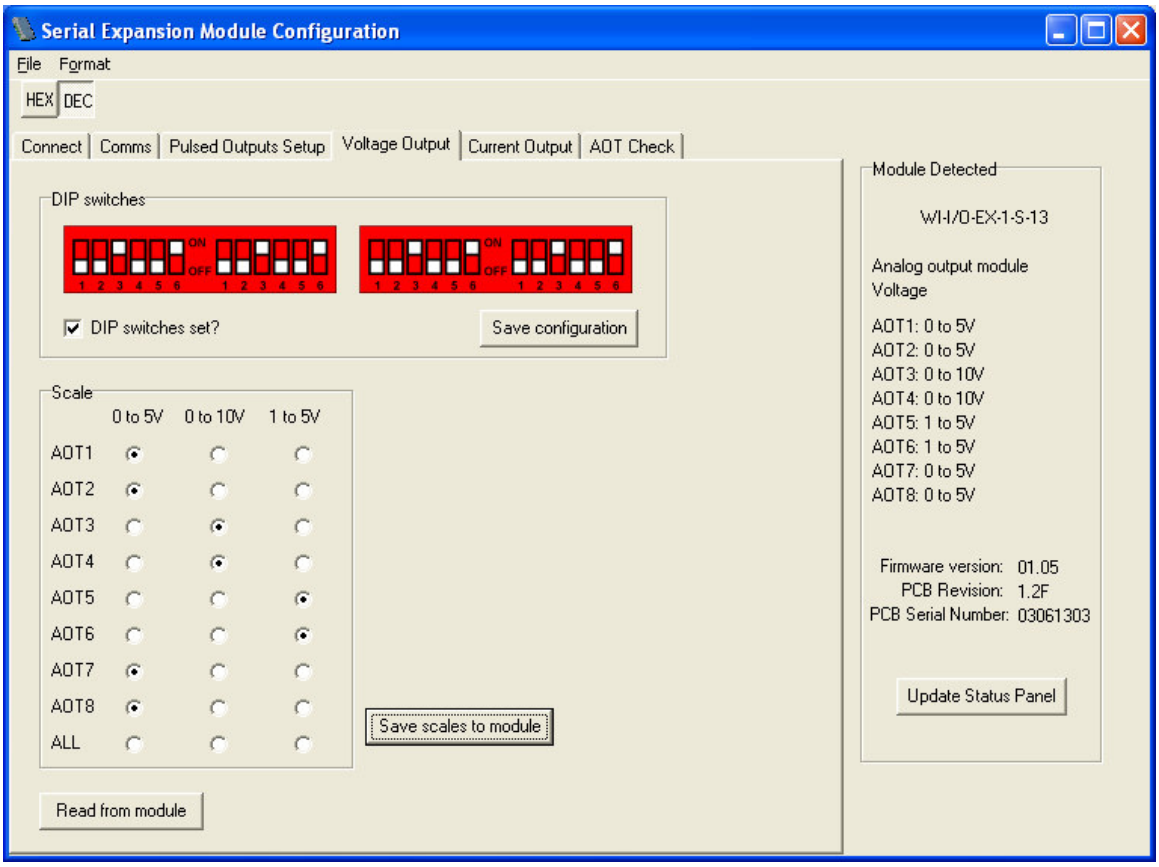


Figure 4-9: Voltage output setup page.

Once the dip switches on the unit are set, tick the checkbox on the form, and click *Save configuration.* Check the *WI-I/O-EX Detected* panel to ensure that the analog mode has been updated (to Voltage).

Clicking *Read from WI-I/O-EX* will read the scales out of the unit (if any) and display them in the scales grid. Note that the dip switches should be set correctly for this result to be relevant.

Choose the desired scale for each channel in the *Scale* box. Click the *Save scales to WI-I/O-EX* button, and check that the scales are updated in the *WI-I/O-EX Detected* panel.

4.5.2 Current output

Current outputs may be selected in the scales 0 to 10mA, 0 to 20mA, or 4 to 20mA. For each scale, the minimum to maximum signal levels are represented by 4000 hex to C000 hex. **Table 4-4** shows how signals from other wireless products translate to WI-I/O-EX-1-S-13 current levels.

WI-I/O-EX-1-S-13 Current scale	WI-I/O 9-1 Input current (mA)	WI-I/O 9-2 Input current (mA)	WI- GTWY Register value (hex)	WI-I/O-EX-1-S-13 Output current (mA)
0 to 10mA	4	4	4000	0
	20	20	C000	10
0 to 20mA	4	4	4000	0
	20	20	C000	20
4 to 20mA	N/A*	0	2000	0
	2*	2	3000	2
	4	4	4000	4
	20	20	C000	20

Table 4-4: Compatibility of other products with WI-I/O-EX-1-S-13 voltage outputs.
***Reduced accuracy for less than 4mA in WI-I/O 9-1.**

To configure the WI-I/O-EX-1-S-13 for current output, select the page as shown in Figure 4-10.

> Remove the access panel from the front of the WI-I/O-EX-1-S-13 case to gain access to the dip switches. Replace the access panel after setting the switches.

Set the switches according to the picture shown. The unit should be orientated with the 20-way connector towards you.

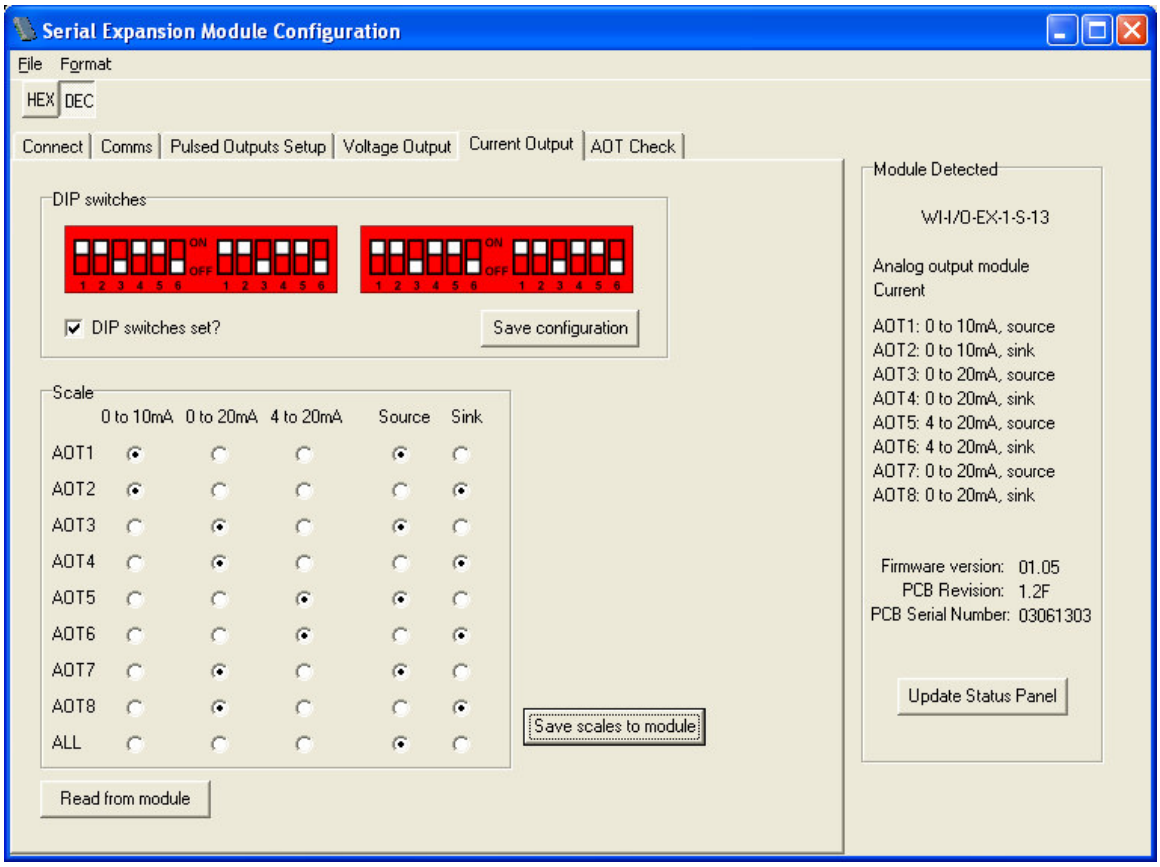


Figure 4-10: Current output setup page.

Once the dip switches on the unit are set, tick the checkbox on the form, and click *Save configuration.* Check the *WI-I/O-EX Detected* panel to ensure that the analog mode has been updated (to Current).

Clicking *Read from WI-I/O-EX* will read the scales out of the unit (if any) and display them in the scales grid. Note that the dip switches should be set correctly for this result to be relevant.

Choose the desired scale for each channel in the *Scale* box. Click the *Save scales to WI-I/O-EX* button, and check that the scales are updated in the *WI-I/O-EX Detected* panel.

5 Operation

5.1 WI-I/O-EX-11 module

The I/O terminal block for the WI-I/O-EX-1-S-11 is shown in Figure 5-1.

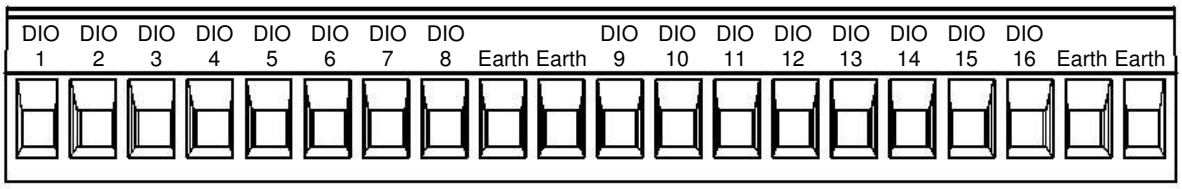


Figure 5-1: I/O terminal block for WI-I/O-EX-1-S-11.

Pulse inputs coincide with DIO terminals 1-4. Pulse outputs coincide with DIO terminals 1-8.

The operation of the digital I/O may be confirmed using the configuration software. Start the software as described in section 4, and choose the *DIO Check* page as shown in Figure 5-2.

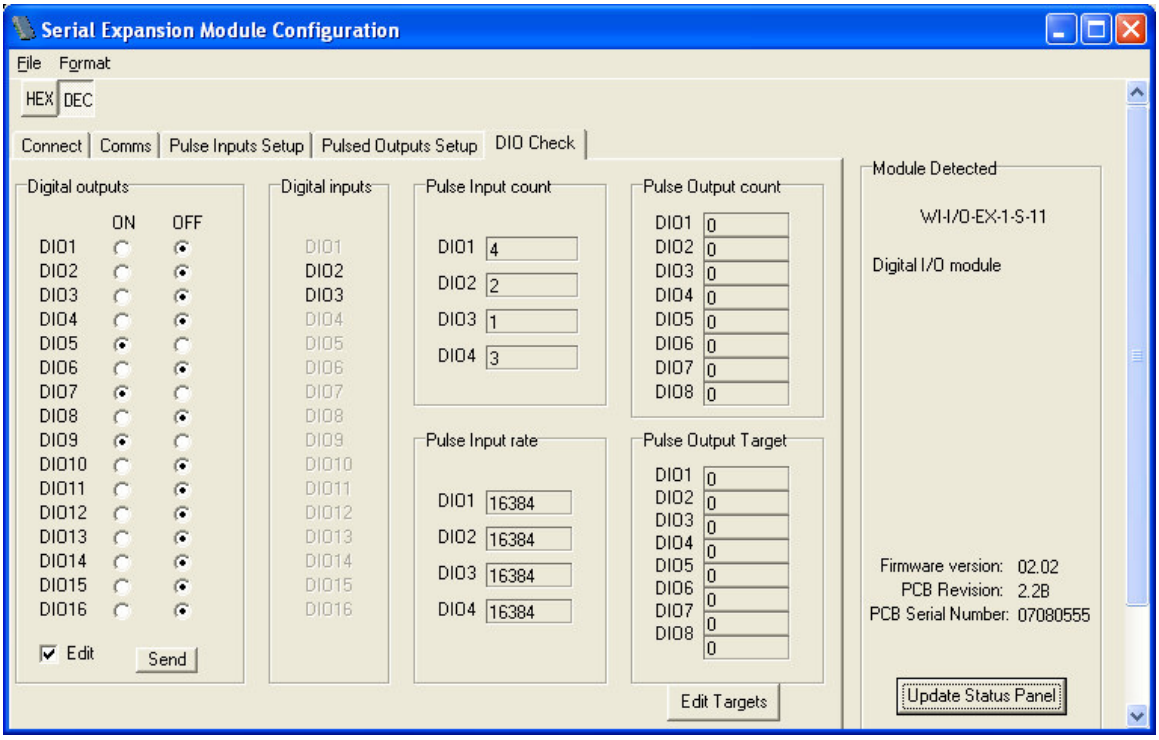


Figure 5-2: Check the operation of the WI-I/O-EX-11 module using the DIO Check page.

Test the digital outputs by setting the select-buttons to ON or OFF - this will force the DO to the selected state.

Digital inputs are reflected in the software by blacking (ON) or greying (OFF) of the associated label in the Digital Inputs column.

The pulsed input count values are shown, as well as the pulse rate. The rate can be viewed in decimal or hexadecimal and represents a fraction of the maximum pulse rate, where hex 4000 is 0% and hex C000 is 100% of the maximum pulse rate.

The pulse output count values are also shown. The pulse out target may be set by clicking the *Edit Targets* button. Pulses will be produced until the count reaches the target.

5.2 WI-I/O-EX-1-S-12 module

The I/O terminal block for the WI-I/O-EX-1-S-12 is shown in Figure 5-3.

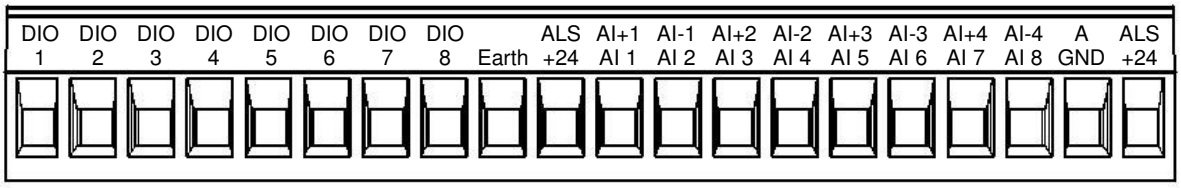


Figure 5-3: I/O terminal block for WI-I/O-EX-1-S-12.

Pulse outputs coincide with DIO terminals 1-8.

The operation of the WI-I/O-EX-1-S-12 may be confirmed using the configuration software. Start the software as described in section 4, and choose the *AIN Check* page as shown in Figure 5-4.

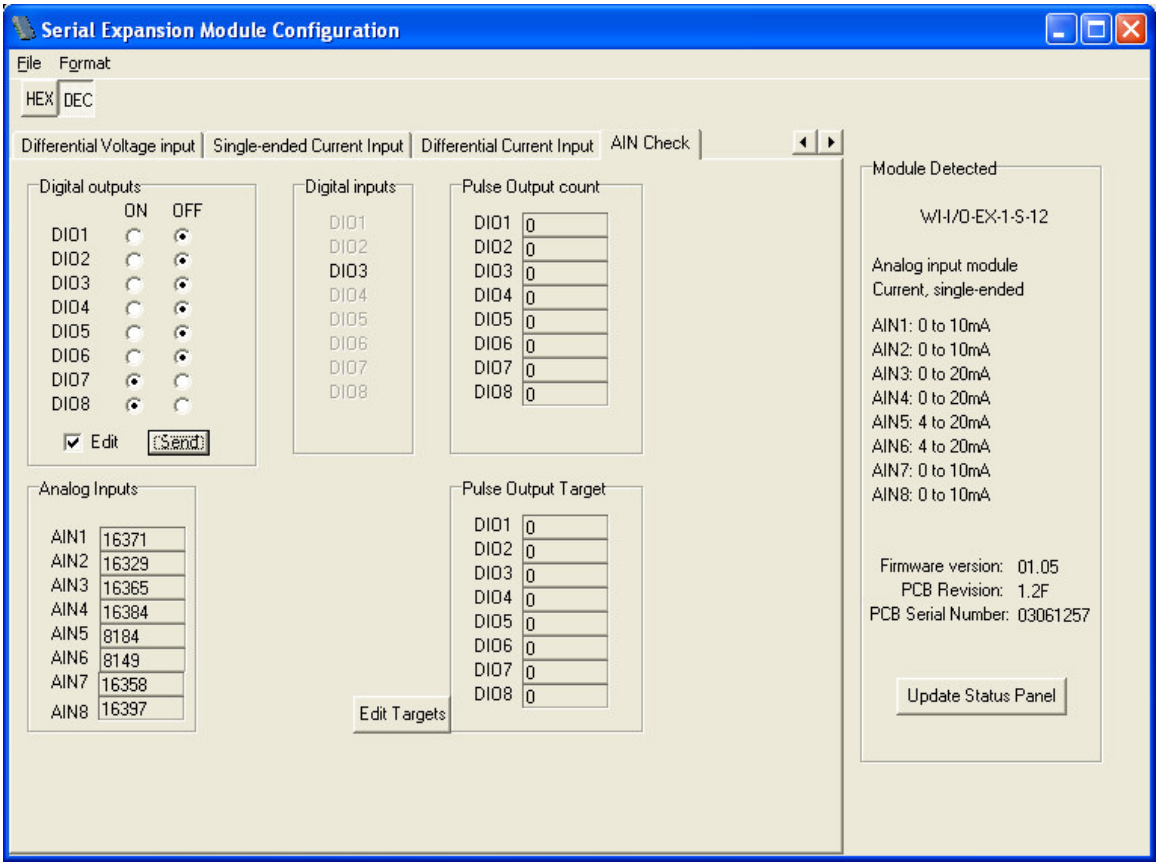


Figure 5-4: Check the operation of the WI-I/O-EX-1-S-12 module with the AIN Check page.

Test the digital outputs by setting the select-buttons to ON or OFF - this will force the DO to the selected state.

Digital inputs are reflected in the software by blacking (ON) or greying (OFF) of the associated label in the Digital Inputs column.

The pulse output count values are also shown. The pulse out target may be set by clicking the *Edit Targets* button. Pulses will be produced until the count reaches the target.

The analog inputs can be viewed in decimal or hexadecimal and represents a fraction of the analog signal, where hex 4000 is 0% and hex C000 is 100%.

In differential configuration, only the value of the first channel in the differential pair shows the quantity being measured. The second channel of each differential pair should be ignored.

5.3 WI-I/O-EX-1-S-13 module

The I/O terminal block for the WI-I/O-EX-1-S-13 is shown in Figure 5-5.

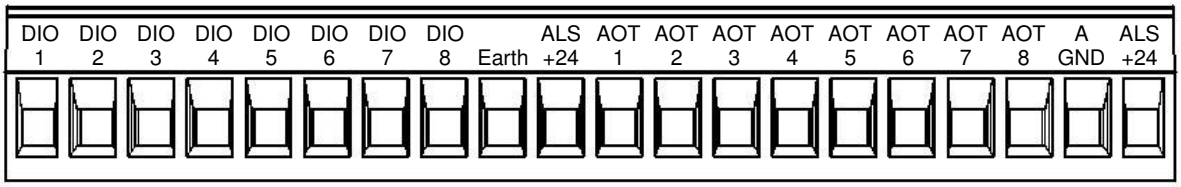


Figure 5-5: I/O terminal block for WI-I/O-EX-1-S-13.

Pulse outputs coincide with DIO terminals 1-8.

The operation of the WI-I/O-EX-1-S-13 may be confirmed using the configuration software. Start the software as described in chapter 4, and choose the *AOT Check* page.

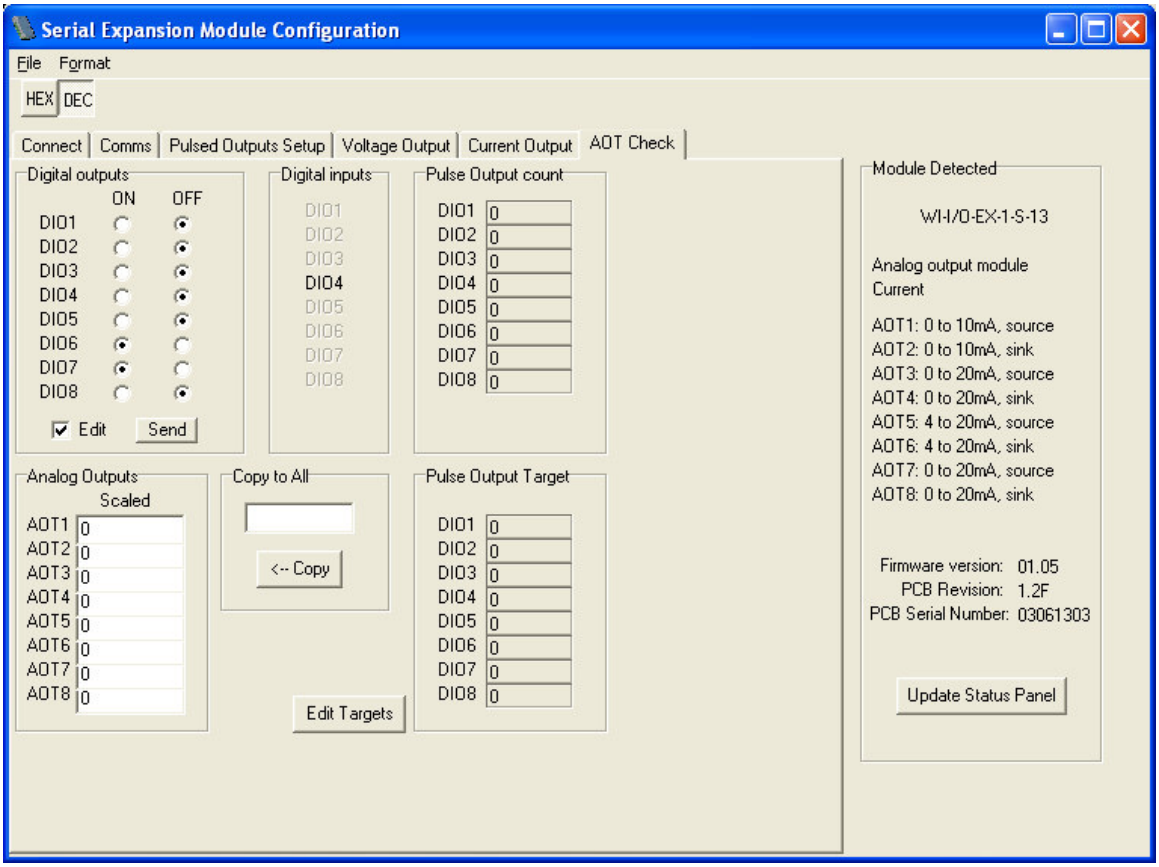


Figure 5-6: Check the operation of the WI-I/O-EX-1-S-13 module using the AOT Check page.

Test the digital outputs by setting the select-buttons to ON or OFF - this will force the DO to the selected state.

Digital inputs are reflected in the software by blacking (ON) or greying (OFF) of the associated label in the Digital Inputs column.

The pulse output count values are also shown. The pulse out target may be set by clicking the *Edit Targets* button. Pulses will be produced until the count reaches the target.

The analog outputs can be viewed in decimal or hexadecimal and represents a fraction of the analog signal, where hex 4000 is 0% and hex C000 is 100%.

The analog output values can be set by the user for testing, and the output signal measured to confirm the analog operation. If you are using hexadecimal values (which is the easiest) ensure the $ symbol precedes the value to denote a hex number.

5.4 Hexadecimal representation of voltage and current levels

The voltage and current levels are represented as a fraction of the configured scale. 4000 hex represents the minimum level in the scale, and C000 hex represents the maximum level in the scale.

Levels and their hex representation are summarized in Table 5-1 for easy reference.

			Voltage scale			Current scale		
Hex value	**Percent**	**Dec value**	**0-5V**	**0-10V**	**1-5V**	**0-10mA**	**0-20mA**	**4-20mA**
0000	0.00%	0	N/A	N/A	N/A	N/A	N/A	N/A
0800	3.13%	2048	N/A	N/A	N/A	N/A	N/A	N/A
1000	6.25%	4096	N/A	N/A	N/A	N/A	N/A	N/A
1800	9.38%	6144	N/A	N/A	N/A	N/A	N/A	N/A
2000	12.50%	8192	N/A	N/A	0.00	N/A	N/A	0.00
2800	15.63%	10240	N/A	N/A	0.25	N/A	N/A	1.00
3000	18.75%	12288	N/A	N/A	0.50	N/A	N/A	2.00
3800	21.88%	14336	N/A	N/A	0.75	N/A	N/A	3.00
4000	25.00%	16384	0.00	0.00	1.00	0.00	0.00	4.00
4800	28.13%	18432	0.31	0.63	1.25	0.63	1.25	5.00
5000	31.25%	20480	0.63	1.25	1.50	1.25	2.50	6.00
5800	34.38%	22528	0.94	1.88	1.75	1.88	3.75	7.00
6000	37.50%	24576	1.25	2.50	2.00	2.50	5.00	8.00
6800	40.63%	26624	1.56	3.13	2.25	3.13	6.25	9.00
7000	43.75%	28672	1.88	3.75	2.50	3.75	7.50	10.00
7800	46.88%	30720	2.19	4.38	2.75	4.38	8.75	11.00
8000	50.00%	32768	2.50	5.00	3.00	5.00	10.00	12.00
8800	53.13%	34816	2.81	5.63	3.25	5.63	11.25	13.00
9000	56.25%	36864	3.13	6.25	3.50	6.25	12.50	14.00
9800	59.38%	38912	3.44	6.88	3.75	6.88	13.75	15.00
A000	62.50%	40960	3.75	7.50	4.00	7.50	15.00	16.00
A800	65.63%	43008	4.06	8.13	4.25	8.13	16.25	17.00
B000	68.75%	45056	4.38	8.75	4.50	8.75	17.50	18.00
B800	71.88%	47104	4.69	9.38	4.75	9.38	18.75	19.00
C000	75.00%	49152	5.00	10.00	5.00	10.00	20.00	20.00
C800	78.13%	51200	5.31	10.63	5.25	10.63	21.25	21.00
D000	81.25%	53248	5.63	11.25	5.50	11.25	22.50	22.00
D800	84.38%	55296	5.94	11.88	5.75	11.88	23.75	23.00
E000	87.50%	57344	6.25	12.50	6.00	12.50	N/A	24.00
E800	90.63%	59392	6.56	13.13	6.25	13.13	N/A	N/A
F000	93.75%	61440	6.88	13.75	6.50	13.75	N/A	N/A

Table 5-1: Hex representation of voltage and current levels.

Appendix A. ModBus address map

A.1. WI-I/O-EX-11

Data	ModBus I/O Type	ModBus Addresses
Digital input 1	Input status	10001
Digital input 2	Input status	10002
Digital input 3	Input status	10003
Digital input 4	Input status	10004
Digital input 5	Input status	10005
Digital input 6	Input status	10006
Digital input 7	Input status	10007
Digital input 8	Input status	10008
Digital input 9	Input status	10009
Digital input 10	Input status	10010
Digital input 11	Input status	10011
Digital input 12	Input status	10012
Digital input 13	Input status	10013
Digital input 14	Input status	10014
Digital input 15	Input status	10015
Digital input 16	Input status	10016
Digital output 1	Coil status	00001
Digital output 2	Coil status	00002
Digital output 3	Coil status	00003
Digital output 4	Coil status	00004
Digital output 5	Coil status	00005
Digital output 6	Coil status	00006
Digital output 7	Coil status	00007
Digital output 8	Coil status	00008
Digital output 9	Coil status	00009
Digital output 10	Coil status	00010
Digital output 11	Coil status	00011
Digital output 12	Coil status	00012
Digital output 13	Coil status	00013
Digital output 14	Coil status	00014
Digital output 15	Coil status	00015
Digital output 16	Coil status	00016
Pulse input count 1	Input registers	30017 – 30018
Pulse input count 2	Input registers	30019 – 30020
Pulse input count 3	Input registers	30021 – 30022
Pulse input count 4	Input registers	30023 – 30024
Pulse input rate 1	Input registers	30001
Pulse input rate 2	Input registers	30002

Data	ModBus I/O Type	ModBus Addresses
Pulse input rate 3	Input registers	30003
Pulse input rate 4	Input registers	30004
Maximum input pulse rate 1	Input registers	30101
Maximum input pulse rate 2	Input registers	30102
Maximum input pulse rate 3	Input registers	30103
Maximum input pulse rate 4	Input registers	30104
Pulse output count 1	Input registers	30009
Pulse output count 2	Input registers	30010
Pulse output count 3	Input registers	30011
Pulse output count 4	Input registers	30012
Pulse output count 5	Input registers	30013
Pulse output count 6	Input registers	30014
Pulse output count 7	Input registers	30015
Pulse output count 8	Input registers	30016
Pulse output target 1	Holding registers	40009
Pulse output target 2	Holding registers	40010
Pulse output target 3	Holding registers	40011
Pulse output target 4	Holding registers	40012
Pulse output target 5	Holding registers	40013
Pulse output target 6	Holding registers	40014
Pulse output target 7	Holding registers	40015
Pulse output target 8	Holding registers	40016
Pulse out update time 1	Input registers	30109
Pulse out update time 2	Input registers	30110
Pulse out update time 3	Input registers	30111
Pulse out update time 4	Input registers	30112
Pulse out update time 5	Input registers	30113
Pulse out update time 6	Input registers	30114
Pulse out update time 7	Input registers	30115
Pulse out update time 8	Input registers	30116
Module supply voltage*	Input registers	30033
Serial port transmission mode	Input registers	30201
Serial port baud rate	Input registers	30202
Serial port parity and stop bit	Input registers	30203

* 0x4000 = 8V; 0xC000 = 16V

A.2. WI-I/O-EX-1-S-12

Data	ModBus I/O Type	ModBus Addresses
Digital input 1	Input status	10001
Digital input 2	Input status	10002
Digital input 3	Input status	10003
Digital input 4	Input status	10004
Digital input 5	Input status	10005
Digital input 6	Input status	10006
Digital input 7	Input status	10007
Digital input 8	Input status	10008
Digital output 1	Coil status	00001
Digital output 2	Coil status	00002
Digital output 3	Coil status	00003
Digital output 4	Coil status	00004
Digital output 5	Coil status	00005
Digital output 6	Coil status	00006
Digital output 7	Coil status	00007
Digital output 8	Coil status	00008
Pulse output count 1	Input registers	30009
Pulse output count 2	Input registers	30010
Pulse output count 3	Input registers	30011
Pulse output count 4	Input registers	30012
Pulse output count 5	Input registers	30013
Pulse output count 6	Input registers	30014
Pulse output count 7	Input registers	30015
Pulse output count 8	Input registers	30016
Pulse output target 1	Holding registers	40009
Pulse output target 2	Holding registers	40010
Pulse output target 3	Holding registers	40011
Pulse output target 4	Holding registers	40012
Pulse output target 5	Holding registers	40013
Pulse output target 6	Holding registers	40014
Pulse output target 7	Holding registers	40015
Pulse output target 8	Holding registers	40016
Pulse out update time 1	Input registers	30109
Pulse out update time 2	Input registers	30110
Pulse out update time 3	Input registers	30111
Pulse out update time 4	Input registers	30112
Pulse out update time 5	Input registers	30113
Pulse out update time 6	Input registers	30114
Pulse out update time 7	Input registers	30115
Pulse out update time 8	Input registers	30116
Analog inputs 1	Input registers	30001

Data	ModBus I/O Type	ModBus Addresses
Analog inputs 2	Input registers	30002
Analog inputs 3	Input registers	30003
Analog inputs 4	Input registers	30004
Analog inputs 5	Input registers	30005
Analog inputs 6	Input registers	30006
Analog inputs 7	Input registers	30007
Analog inputs 8	Input registers	30008
Module supply voltage*	Input registers	30033
Analog supply voltage (24V)+	Input registers	30034
Serial port transmission mode	Input registers	30201
Serial port baud rate	Input registers	30202
Serial port parity and stop bit	Input registers	30203

* 0x4000 = 8V; 0xC000 = 16V

+ 0x4000 =12V; 0xC000 = 36V

A.3. WI-I/O-EX-1-S-13

Data	ModBus I/O Type	ModBus Addresses
Digital input 1	Input status	10001
Digital input 2	Input status	10002
Digital input 3	Input status	10003
Digital input 4	Input status	10004
Digital input 5	Input status	10005
Digital input 6	Input status	10006
Digital input 7	Input status	10007
Digital input 8	Input status	10008
Digital output 1	Coil status	00001
Digital output 2	Coil status	00002
Digital output 3	Coil status	00003
Digital output 4	Coil status	00004
Digital output 5	Coil status	00005
Digital output 6	Coil status	00006
Digital output 7	Coil status	00007
Digital output 8	Coil status	00008
Pulse output count 1	Input registers	30009
Pulse output count 2	Input registers	30010
Pulse output count 3	Input registers	30011
Pulse output count 4	Input registers	30012
Pulse output count 5	Input registers	30013
Pulse output count 6	Input registers	30014
Pulse output count 7	Input registers	30015
Pulse output count 8	Input registers	30016
Pulse output target 1	Holding registers	40009
Pulse output target 2	Holding registers	40010
Pulse output target 3	Holding registers	40011
Pulse output target 4	Holding registers	40012
Pulse output target 5	Holding registers	40013
Pulse output target 6	Holding registers	40014
Pulse output target 7	Holding registers	40015
Pulse output target 8	Holding registers	40016
Pulse out update time 1	Input registers	30109
Pulse out update time 2	Input registers	30110
Pulse out update time 3	Input registers	30111
Pulse out update time 4	Input registers	30112
Pulse out update time 5	Input registers	30113
Pulse out update time 6	Input registers	30114
Pulse out update time 7	Input registers	30115
Pulse out update time 8	Input registers	30116

Data	ModBus I/O Type	ModBus Addresses
Analog outputs 1	Holding registers	40001
Analog outputs 2	Holding registers	40002
Analog outputs 3	Holding registers	40003
Analog outputs 4	Holding registers	40004
Analog outputs 5	Holding registers	40005
Analog outputs 6	Holding registers	40006
Analog outputs 7	Holding registers	40007
Analog outputs 8	Holding registers	40008
Module supply voltage*	Input registers	30033
Analog supply voltage (28V) +	Input registers	30034
Serial port transmission mode	Input registers	30201
Serial port baud rate	Input registers	30202
Serial port parity and stop bit	Input registers	30203

* 0x4000 = 8V; 0xC000 = 16V

+ 0x4000 =12V; 0xC000 = 36V

Appendix B. ModBus Functionality

Table B-1 specifies the maximum query and response data parameters for the WI-I/O-EX modules. See the Gould ModBus Protocol Reference guide (PI-MBUS 300 Rev B) for more detail.

Function code	**Description**	**Maximum Data Size**
1,2	Read coil / input status	1160 coils / inputs
3	Read holding (output) registers	145 registers
4	Read input registers	145 registers
5	Force single coil	1 coil
6	Set single register	1 register
7	Read exception status	8 coils
8	Loopback test	N/A
9,10	NOT SUPPORTED	NOT SUPPORTED
11	Communications event counter	N/A
12-14	NOT SUPPORTED	NOT SUPPORTED
15	Force multiple coils	1160 coils
16	Set multiple registers	145 registers
17-255	NOT SUPPORTED	NOT SUPPORTED

Table B-1: Supported ModBus functions and limitations for WI-I/O-EX modules.

Appendix C. Comms Recovery

If the communications setting of the WI-I/O-EX has been forgotten or mistakenly set, there is a way of recovering serial communications with the WI-I/O-EX. WI-I/O-EX firmware versions 1.04 and earlier require ModScan to do this. With later firmware versions, this can be done using the configuration software, cfg_WI-I/O-EX_Vx.xx.exe.

Procedure for recovering communications with recent firmware (V1.05 and later):

1. Set the ModBus address switches to 00. This fixes the communications setting to ModBus RTU, 9600 baud, no parity, and one stop bit.
2. Connect a standard (straight-through) RS232 cable to the module and the PC.
3. Start the configuration software, cfg_WI-I/O-EX_Vx.xx.exe.
4. Set the slave address to 100.
5. Ensure the comms settings are 9600 baud, no parity, one stop bit.
6. Click *Connect to WI-I/O-EX*
7. The module should connect successfully.
8. Choose the Comms page and change the settings to the desired parameters.
9. If the module did not connect successfully, try the steps listed below for using ModScan.

Procedure for recovering communications with firmware V1.04 and earlier:

1. Set the ModBus address switches to 00. This fixes the communications setting to those specified in step 6.
2. Connect the RS232 port to the PC and start ModScan.
3. Supply power to the WI-I/O-EX.
4. In ModScan, set the following
   - Address: 0201
   - Length: 3
   - Device ID: 100
   - ModBus Point Type: Holding register
5. Click Connection / Connect.
6. Choose the appropriate COM port. Also choose
   - Baud rate: 9600
   - Word length: 8
   - Parity: none
   - Stop bits: 1
7. Click Protocol Selection. Choose STANDARD ASCII for Transmission mode. Click OK, OK.
8. ModScan should connect to the module with no errors.
9. The registers displayed in ModScan represent the serial port settings that are used when the address switches are set to other than 00, as follows:

Address	Description
40201	Serial port transmission mode
40202	Serial port baud rate
40203	Serial port parity and stop bit

10. Use the tables below to work out the current communications settings, or write to the registers using ModScan to change the settings to the desired values. Note that the module transmission mode should be set to ModBus RTU.

ModBus address 40201, serial port transmission mode:

Setting	Register Value
ModBus RTU	0x0101
ModBus ASCII, 8 data bits	0x0201
ModBus ASCII, 7 data bits	0x0202

ModBus address 40202, serial port baud rate:

Setting	Register Value
1200	0x000C
2400	0x0018
4800	0x0030
9600	0x0060
14400	0x0090
19200	0x00C0
28800	0x0120
38400	0x0180
57600	0x0240
76800	0x0300
115200	0x0480

ModBus address 40203, serial port parity and stop bit:

Parity Setting	Register's High Byte Value
None	0x00
Odd	0x11
Even	0x22

Stop-bit Setting	Register's Low Byte Value
1 stop bit	0x11
2 stop bits	0x22

11. Once the new comms setting are correct, be sure to change the address switches back to a non-zero setting for normal operation.

Appendix D. Specifications

EMC Approval	EN 55024:1998 EN 61000-3-2: 2002 EN 61000-3-3: 2002 EN 55022: 1998 FCC Part 15	
Operating temperature range	-40 to +60 deg C	
Power supply	10.8 – 30.0 VDC 13.8V / 24VDC nom	***Model Dependent. Check rear label for actual operating voltages***
Supply current (idle 13.8V) -11 -12 -13	 100mA 100mA 120mA	
Supply current for I/O per digital input per digital output per analog input per analog output	 13mA 13mA 50mA 50mA	 If using 24V loop supply
Loop supply	24V nominal *	* Loop supply will follow WI-I/O-EX-xx power supply voltage above 24V input.
Loop supply max current	WI-I/O-EX-12 : 270mA WI-I/O-EX-13 : 160mA	
RS232 port	ModBus protocol	
RS485 port	ModBus protocol WI-Series protocol	
ModBus protocol		
Transmission modes	ModBus ASCII 8 data bits ModBus ASCII 7 data bits** ModBus RTU	** If no parity, use 2 stop bits. If using parity, use 1 stop bit.
Baud rates	1200; 2400; 4800; 9600; 14,400; 19,200; 28,800; 38,400; 57,600; 76,800; 115,200	
Parity	Odd, even, none	
Stop bits	1, 2	
Slave address	01 - 99	
Default settings	If slave address = 0	ModBus RTU, 9600, N, 1
Digital inputs		

On-state voltage	<2.1VDC	
Wetting current	5mA	
Max pulse input rate	1kHz	
Minimum pulse width	0.5mS	
Max pulse input count	4294967295 (32-bit)	
Digital outputs		
Output voltage range	0-30VDC	
Output current max	200mA	
Max pulse output rate	100Hz	
Max pulse output count	65535	
Analog Inputs		
Input voltage range	0-12V	
Voltage resolution	16 bits	
Input current range	0-24mA	
Current resolution	16 bits	
Input impedance (voltage)	100k	
Input impedance (current)	100ohm	
Common mode voltage range	27VDC	
Calibrated accuracy	0.10%	
Analog Outputs		
Output voltage range	0-12V	
Voltage resolution	12 bits	
Output current range	0-24mA	Total output current 160mA
Current resolution	12 bits	
Calibrated accuracy	0.10%	

Table D-1: WI-I/O-EX Specifications.

WI-I/O-EX-1-S	**-11**	**-12**	**-13**
Digital inputs/outputs	Up to 16	Up to 8	Up to 8
Pulse outputs	8	8	8
Pulse inputs	4	-	-
Analog inputs	-	4 floating / 8 commoned	-
Analog outputs	-	-	8

Table D-2: WI-I/O-EX module types and I/O.

Appendix E. RS232 Wiring

The RS232 connection to the WI-I/O-EX modules requires a standard straight-through serial cable (modem cable). The wiring is shown in Figure E-1.

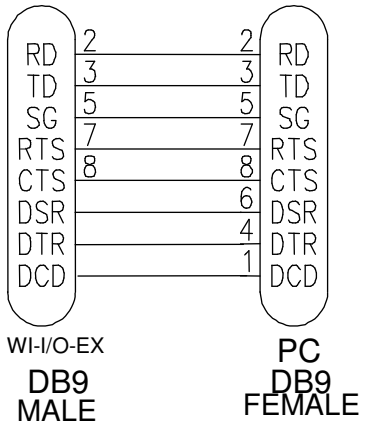


Figure E-1: Wiring for RS232 cable for PC-WI-I/O-EX communications.